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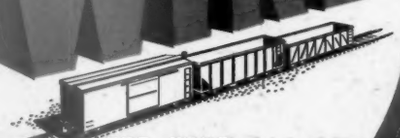

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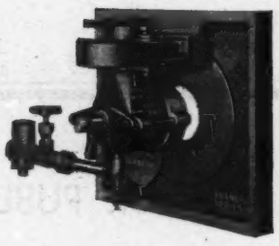

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THE EDITOR'S DESK

YOUR PUBLISHER'S PROBLEMS

Undoubtedly most of our readers are already aware, from announcements made in the newspapers and other magazines, that the publishers will be forced to reduce the amount of paper and other materials that they have been using. This reduction will hit our publication rather hard, because we have for many years exercised unusual care in the control of such items.

Because we are enthusiastic in supporting any measures that will help to win the war, we shall of course gladly accede to these regulations. In so doing, however, we shall make every possible attempt to accomplish the necessary ends without reducing the quality of service to our readers and advertisers.

Rather than cut down the number of pages we shall go to lighter weight paper stock. Beginning with the April issue we shall reduce the trim size of the page; the size of the printed page, however, will remain the same. The effect, no doubt, will be to produce a less pleasing area of white space in which the type page will be framed; it will require no change whatever in the arrangement of the type page.

In the past we have favored the subscribers who were lax in renewing their subscriptions, by extending credit to them until we received definite word as to their intentions. It will be necessary to take somewhat drastic measures in that respect, and if you are careless in renewing your subscription you may miss some of the issues. Frankly, we don't like to take this step, but it is quite necessary if we are to make the necessary savings in paper.

This is a war of production in which the railroads are a most essential element. Publishers of business and technical papers, such as ours, can take considerable pride in the fact that those high in authority in the Administration have recognized the business press as being of greatest value in the emergency, in helping to stimulate greater efficiency and effectiveness in industry and transportation. This appreciation has been voiced in many ways and it has given us confidence to go forward with greater energy and vigor in the attempt to serve our readers and advertisers. We shall do our level best to turn out a creditable magazine and we bespeak your patience in the months to come, if it shows evidences of the effects of war.

We have on the desk before us a number of British papers, including copies of the (London) Railway Gazette. We take off our hats to them for the splendid job that they are doing, under conditions that must be much more severe than any that have been encountered in this country.

Roy V. Wright

RAILWAY MECHANICAL ENGINEER

Founded in 1832 as the American Rail-Road Journal

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MARCH, 1943

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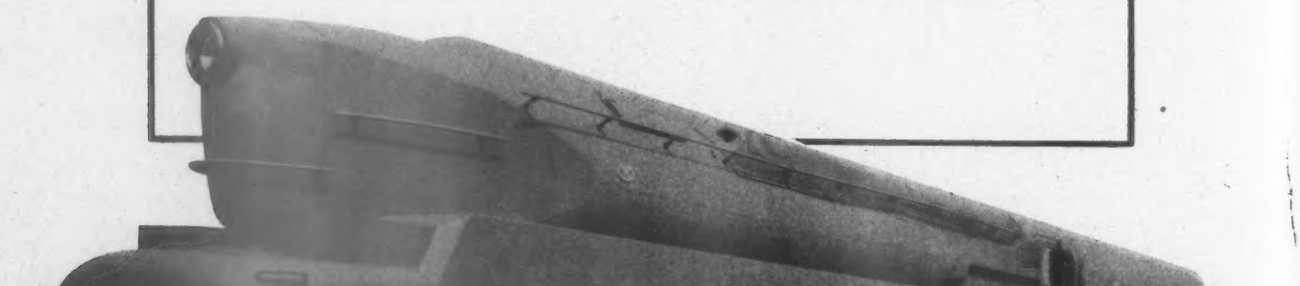

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Reducing Weight of

Diesel Road Locomotives*

By P. B. Jackson†

Small-bore cylinders, small engine-generator units, higher engine speeds, and extensive use of aluminum are proposed

In the speed range above 20 m.p.h. the available tractive force of a road locomotive, for either freight or passenger service, is limited to the power developed by the Diesel engines. This is not sufficient to produce maximum tractive force in the high-speed range. Maximum tractive force for any locomotive can be attained by making all axles driving axles, but the weight of present Diesel road locomotives make this impractical and, in fact, of little advantage in the overall performance of the unit. In spite of the possibilities of large weight saving it is doubtful if a road locomotive will ever be light enough to make its starting and low-speed performance unsatisfactory.

In Table I are set forth some of the characteristics of two locomotives. Locomotive *A* is an existing unit of 6,000 hp. Locomotive *B* is a unit intended for the same service and to give approximately the same performance. The two outstanding differences are a reduction of weight of 275,000 lb. and a reduction in horsepower of 750. Further reference to this table will be made after comparisons of the performance curves are completed.

Fig. 1 shows a series of curves that compare several performance factors of the two locomotives whose characteristics are outlined in the table. Curves 1 and 2 are the available tractive force of locomotives *A* and *B*, respectively. Numbers 3 and 4 are resistance curves of each locomotive plus a trailing load of 15 cars weighing 66 tons each. It will be noted that these cross at 100 m.p.h. for the *A* powered train and 97.5 m.p.h. for the

* Abstract of a paper presented before a joint session of the Oil and Gas Power and Railroad divisions at the annual meeting of the American Society of Mechanical Engineers, December 2, 1942.

† Mr. Jackson is with the Aluminum Company of America.

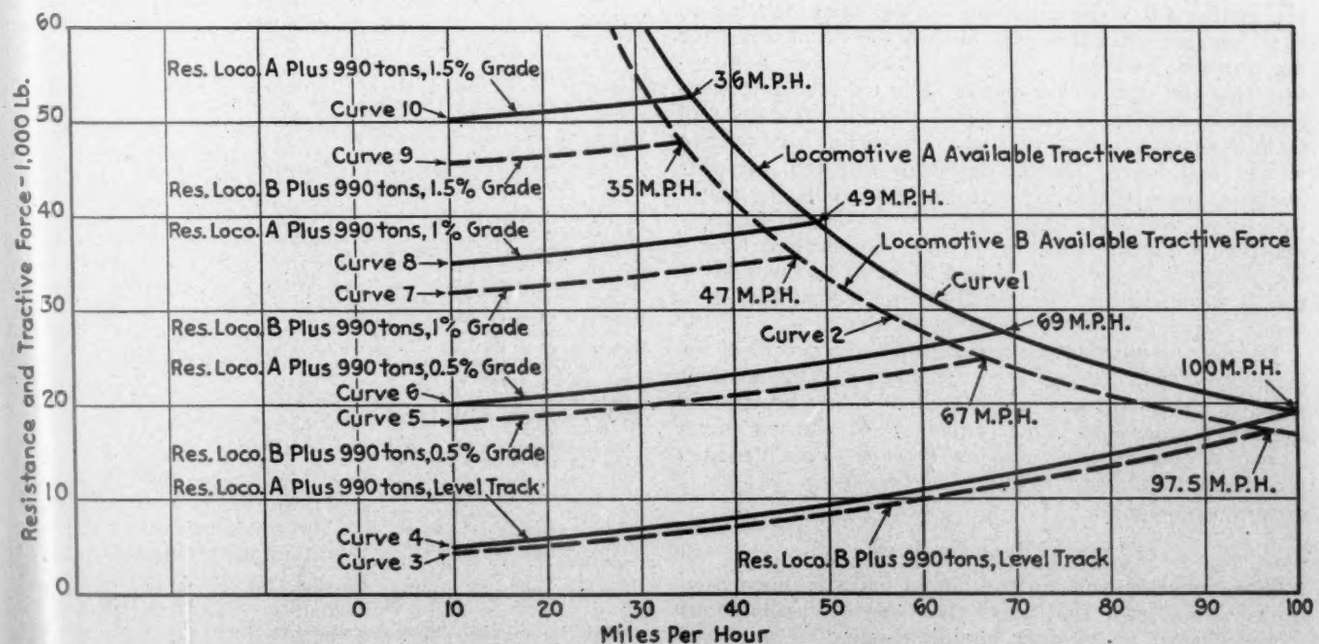
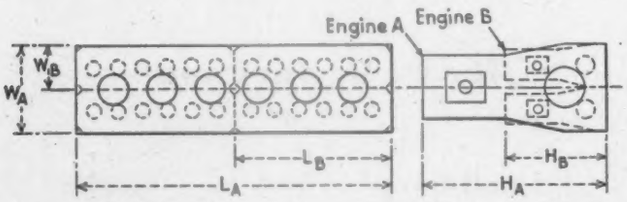

Resistance and Tractive Force - 1,000 Lb.
Miles Per Hour
Res. Loco. A Plus 990 tons, 1.5% Grade
Curve 10
Curve 9
Res. Loco. B Plus 990 tons, 1.5% Grade
Res. Loco. A Plus 990 tons, 1% Grade
Curve 8
Curve 7
Res. Loco. B Plus 990 tons, 1% Grade
Res. Loco. A Plus 990 tons, 0.5% Grade
Curve 6
Curve 5
Res. Loco. B Plus 990 tons, 0.5% Grade
Res. Loco. A Plus 990 tons, Level Track
Curve 4
Curve 3
Res. Loco. B Plus 990 tons, Level Track
36 M.P.H.
35 M.P.H.
49 M.P.H.
47 M.P.H.
69 M.P.H.
67 M.P.H.
100 M.P.H.
97.5 M.P.H.
Locomotive A Available Tractive Force
Locomotive B Available Tractive Force
Curve 1
Curve 2

Fig. 1—Resistance and tractive-force curves of the locomotives in Table 1 plus 15 66-ton cars

B powered train. These maximum speeds are for equal trailing or revenue producing capacity. The *B* unit is 750 hp. less than the *A* unit, and obviously is the more economical to operate. The difference in maximum speed of the two trains, both on level track as well as on grades, are so small that differences in the mechanical, electrical, or track conditions would produce performance variations of greater magnitude than are indicated by these curves.

Curves Nos. 5 to 10, inclusive, Fig. 1, indicate the total train resistances on ½, 1 and 1½-per cent grades. They illustrate the value in weight reduction in the locomotive, particularly at speeds below 70 m.p.h.

The table shows some of the economies which may be realized in the operation of a light road locomotive. The fuel saved per year, on the basis of a 60 per cent



	Engine *A*	Engine *B*	Combined small engines
Number of cylinders	6	6	24
Horsepower	4	1	4
Bore	2	1	1
Stroke	2	1	1
R. p. m.	1	2	2
Piston speed	1	1	1
Mean effective pressure	1	1	1
Compactness factor	8	1	4
Weight factor	8	1	4

Compactness factor — (constant) HWL
Weight factor = (Constant) (Compactness factor)

Fig. 2—Comparison of compactness and weights of Diesel engines with large and small cylinders

load factor and 6,000 hrs. a year operation, amounts to 145,000 gals. With a lubricating-oil consumption of 3,000-hp. hrs. per gal. under like operation a saving of 900 gals. per year could be expected.

The first cost of the light locomotive is difficult to estimate until more detailed specifications and designs are completed. The notations in the table relating to first cost are estimates only but can be rationalized for the purpose intended. They are based on the assumption that the cost of locomotive *A* bears a definite relation to its horsepower and that locomotive *B* costs will be in close agreement except where materials used to save weight cost more than the materials replaced. In this analysis, some 48,000 lb. were saved by replacing materials now used with aluminum. At a cost of 40 cents per pound saved, which is a very conservative figure, the weight reduction would add $19,200 to the cost of the *B* locomotive. The total cost of locomotive *A* is about 10 per cent higher than the *B* unit.

Because no unusual engineering has been proposed for locomotive *B*, maintenance cost should be no higher than existing equipment and might well be lower because of the fewer axles and lighter axle loads. The use of an increased number of engines should lead to maintenance procedure that could easily result in lower costs and greater availability.

Small Bore Engines

Many developments in the Diesel industry have been made in the past few years that have contributed to more compact and lighter engine designs. Engines of 10 lb. per hp. are available at conservative rating and are as long lived and reliable as their earlier predecessors. Three major developments are responsible, each contributing to the greater compactness and lighter weight. Each of these developments will be discussed briefly and are: (1) the practicability of small cylinder sizes, resulting from advances in injection equipment; (2) supercharging, allowing for higher safe engine rating; (3) materials relatively new in Diesel construction.

The combustion characteristics of Diesel engines are easier to control in large cylinder sizes because of the greater distances available for fuel penetration and larger quantities of fuel handled per cycle. Developments in injection equipment have made possible excellent combustion characteristics in small cylinders without the necessity of providing pre-combustion chambers which are prevalent in the automotive engine designs.

Engine dimensions for any given standard of design vary directly with the bore. In other words, the overall lineal dimensions are reduced directly with the bore. Fig. 2 shows these relations in a comparison between engines with bores in the ratio of 2:1. Specifically stated, a single 1,000-hp. engine will weigh twice as much as four 250-hp. engines having a bore one-half that of the large engine. The space occupied by the four smaller engines will be half that of the single large unit. These reductions have been made without change in the engine rating, materials of construction, or design standards such as unit bearing pressures, cylinder centers, and bore-stroke ratios which are the major factors contributing to reliability and long engine life.

Supercharging

Supercharging has increased engine ratings materially and has also made small cylinder sizes more practical because of the larger quantities of fuel supplied per cycle. Increases in both piston speed and mean effective pressure become mechanical and thermal problems rather than volumetric problems which limit the output of naturally aspirated engines. Changes in engine rating have a direct influence on specific engine weight and

Table I—A Study of Weight-Saving Possibilities in the Diesel Locomotive

	Locomotive A	Locomotive B	Saving
Weight, lb.	1,035,000	760,000	275,000
Horsepower	6,000	5,250	....
Number of axles	18	14	....
Number of engine cylinders	36	120 or 128	....
Weight of Diesel engines, lb.	198,000	52,500	145,500
Weight of Diesel engines per hp., lb.	33	10	....
Weight of electrical equipment, lb.	190,000	166,000	24,000
Weight of electrical equipment per hp., lb.	31.7	31.7	....
Weight of mechanical equipment, lb.	600,000	540,500	59,500
Weight of mechanical equipment per hp., lb.	100	102.75*	....
Weight of lubricating oil, fuel, and water, lb.	47,000	41,000	6,000
Weight saved by eliminating one four-wheel truck, lb.	....	....	26,000
Weight saved by the use of aluminum tanks for oil, fuel and water, lb.	....	....	5,250
Weight saved by the use of aluminum for locomotive cab, lb.	....	....	8,750
Weight saved by the use of aluminum in the Diesel engine, lb.	....	....	34,125
Total weight saved by the use of aluminum, lb.	....	....	48,125
Maximum speed, m. p. h., with 15 66-ton cars:			
On level track	100	97.5	....
On 0.3 per cent grade	69	67.0	....
On 1 per cent grade	49	47.0	....
Fuel oil saved per year, gals.	....	....	145,000
Lubrication oil saved per year, gals.	....	....	900
Cost of locomotive at $100 per hp.	$600,000	$525,000	....
Cost of saving 48,125 lb. at 40 cents per lb.	....	19,250	....
Total cost of locomotives	$600,000	$544,250	$55,750

* This increase is to make allowance for parts such as car heating, equipment, and controls which are common to both locomotives and cannot be reduced in weight on the basis of horsepower.

specific compactness. An increase in both mean effective pressure and piston speed of 18 per cent result in weight and space saving in the order of 40 per cent.

Many, if not all, of the thermal problems in an internal combustion engine are a function of waste heat to be dissipated per cycle per square inch of combustion-chamber area which includes pistons, cylinder head, valves, and cylinder liner. This heat load becomes a function of cylinder diameter. The small engine in the comparison shown on Fig. 2 will have one-half the specific heat load of the large engine. This provides a large factor of safety if higher mean effective pressures are contemplated and will not become the limiting factor in development in this direction within the range of near future probabilities.

Small Engines More Rigid

Analysis of the dynamic loadings which determine many of the bearing loads shows that they are a function of the square of the cylinder diameter and in the comparison in Fig. 3 is shown a ratio of 1:4 in favor of the small engine. Bearing areas are also in the same ratio so that unit bearing pressures do not change in spite of the higher rotative speed of the small engine. The possibility of further small engine development could well be in the direction of increased speed without fear of reaching an impractical or unsafe operating speed range. It is the dynamic loading of an engine that dictates many of its dimensional characteristics which, in turn, determine the rigidity factors. Fig. 3 also shows a comparison of the rigidity between the same two engines previously discussed. The small engine is inherently twice as rigid as the large engine, other factors being the same.

The advantages of a small engine may be summarized as follows: Engine *B*, compared with engine *A*, both having the same specific output, has: (1) half the specific weight; (2) half the specific bulk; (3) the same general volumetric characteristics; (4) half the specific heat load per cycle; (5) one fourth the dynamic load factor, and (6) twice the inherent rigidity.

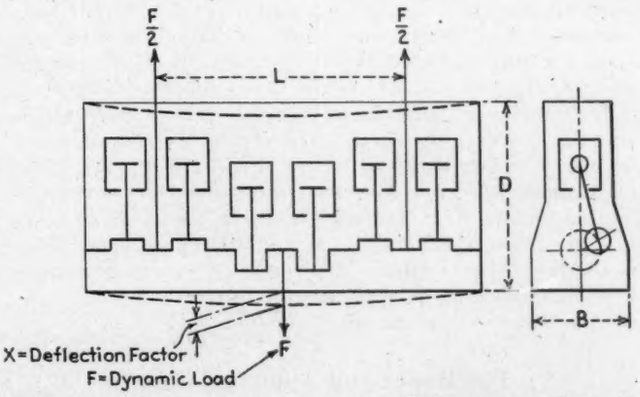
The multiplicity of cylinders appear to be the one major difference that might detract from the comparison of the two engines. This may well be counteracted by the greater basic reliability of the small engines by virtue of lower heat and dynamic load, and deflection factors inherent in the small bore engines. The maintenance problem may well be simpler for the smaller engine because of the reduced weight of all of the engine parts allowing more ease in handling. There is also the possibility of replacing a complete engine generator unit in the event of failure or routine maintenance. A failure of one of the small engines would have far less influence on the locomotive performance than a complete failure of one large engine. Multiplicity of engine cylinders in other internal combustion engine applications have tended to increase reliability.

Where Aluminum Comes In

Aluminum has been extensively used in internal combustion engines for a wide variety of applications. Its characteristics do not, however, lend themselves to all of the parts going to make up a Diesel engine. Crankshafts, camshafts, valves, and cylinder liners are the major items which cannot be made in aluminum. These parts, plus other miscellaneous parts in this same category, however, account for about 25 per cent of the weight of an engine built of cast iron or steel. The cylinder block, crankcase, oil pan, cylinder heads, pistons, gears, gear covers, supercharger housing, manifolds, fuel pump housings, pumps, governor housing, fuel filters, and air filters make up the other 75 per cent of the weight. They can and have all been successfully made in some suitable aluminum alloy. Weight savings from 30 per cent to 70 per cent can be made depending on the function and design characteristics of the particular part. Much experience has shown that an average saving of 50 per cent can be made safely and without compromise to sound design practice. The net result on the total engine weight would be a reduction of 37½ per cent.

The engines for locomotive *B* described earlier in this paper, built of the same materials as engines in the *A* locomotive and with the same piston speed and mean effective pressure weigh 16.5 lb. per hp. Built in aluminum their weight would be 10.3 lb. per hp. This weight so closely approaches the requirement for engine weight set up in the table as to justify its use. Numerous other advantages of aluminum for Diesel engines, all contributing to low specific weight and smaller space requirements could be described but it is beyond the scope of this paper to discuss them. The use of aluminum for the parts proposed is fully justified by operating experience in other applications. They should be carefully engineered for this new application to insure a like satisfactory operating experience.

Referring again to the table, lines 12, 13 and 14 list a total of 40,000 lb. to be saved in parts other than



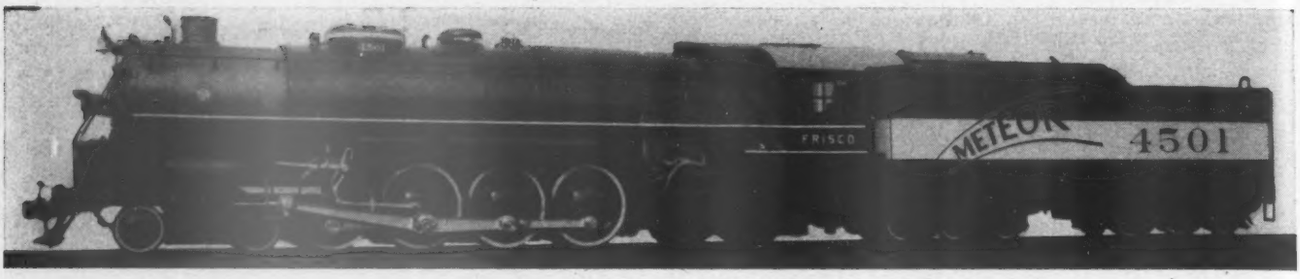
	Engine *A*	Engine *B*
Bore	2	1
R = stroke	2	1
N = r. p. m.	1	2
W = weight of moving parts	8	1
D = height of engine	2	1
B = width of engine	2	1
L = distance between bearings	2	1
F = constant (WRN^2)	4	1
X = constant ($Fl^3 + BD^3$)	2	1

Dynamic loading and deflections comparison

Fig. 3—Comparison of dynamic loading and deflection

engines. A large part of this weight saving can be made by reducing the number of axles under the locomotive with no increase in load per axle. Locomotive *A* was built with 18 axles with a load of 57,500 lb. per axle. Locomotive *B* because of its reduced weight could have 14 axles loaded to 54,250 lb. per axle. Two of the four axles eliminated are included in the saving listed opposite the item "Weight saved in mechanical equipment." The other two axles eliminated are listed on line 13 as "Weight saved by eliminating one four-wheel truck." The saving is 26,000 lb. which is the estimated weight of this assembly less traction motors. This figure subtracted from the 40,000 lb. listed leaves 14,000 lb. to be saved in the cab, tanks, and electrical and mechanical equipment.

(*Continued on page 119*)



One of the Frisco oil-burning 4-8-4 locomotives for passenger service

Frisco 4-8-4 Locomotives

Fifteen units built by Baldwin include three oil-fired locomotives for passenger service —Tractive force 69,000 lb.

BETWEEN August and October of last year the Baldwin Locomotive Works delivered to the St. Louis-San Francisco a total of 15 locomotives of the 4-8-4 type 12 of which were coal fired freight units and the remaining three were oil-fired passenger locomotives. Except for slight differences necessitated by the two types of fuel used all 15 locomotives are identical in design, the weights also differing slightly. The weights and proportions shown in the table are those of the freight locomotives. The weight on drivers of the oil-burning passenger locomotives is 278,300 lb.; the total engine weight, 454,000 lb. and the weight of the tender is 346,000 lb. All of the locomotives have 74-in. drivers and 69,800-lb. tractive force. The new locomotives are in operation on the Eastern division of the Frisco from St. Louis to Monett, Mo., and over the Southwestern division to Tulsa, Okla. The addition of these locomotives, used in conjunction with heavy Mountain type power previously built, has enabled the road to release a number of Mikados and medium-weight Mountain type locomotives for service on other divisions.

The Boiler and Appurtenances

The boilers are of the conical type, built for a 250-lb. working pressure. The barrel is constructed in three courses the first of which is tapered on top and straight at the bottom. The inside diameters of this course vary from $85\frac{15}{16}$ in. at the front to $89\frac{23}{32}$ in. at the rear. The sheet thickness is $1\frac{1}{32}$ in. The second course is straight on top and tapered at the bottom with the inside diameter varying from $91\frac{25}{32}$ in. to $95\frac{9}{16}$ in. The sheet thickness is $1\frac{3}{32}$ in. The third course is straight, $97\frac{3}{4}$ in. inside diameter, and rolled from $1\frac{1}{8}$ in. plate. The back tube sheet, combustion chamber and outside throat sheets are rolled from ½-in. plate; the crown and furnace door sheets are ⅜-in. plate and the crown and furnace side sheets are in one piece. The outside throat sheet is 1 in. thick and the back head is $\frac{9}{16}$ in. The firebox roof sheet is $1\frac{1}{8}$ in. thick and this sheet is joined to the lower outside firebox side sheets, ⅝ in. thick, at a point between the tenth and eleventh rows of staybolts. The front tube sheet, ⅝ in. thick, is a flat sheet of slightly smaller diameter than the inside of the first course. It is welded to a ¾-in. by 4-in. ring which is secured to the barrel by a single row of rivets and seal welded at the top center line.

Welding was used extensively in the construction of these boilers. In addition to the front tube sheet, already mentioned, the back tube sheet is welded to the combustion chamber and the latter to the inside throat sheet. The roof sheet is welded to the lower side sheets; firebox sheets to mudring; crown to door sheet; door sheet to back head in the firedoor opening, and the syphons are welded to the crown and throat sheets.

A complete installation of Flannery flexible staybolts is used in the combustion chamber, throat sheet, the breaking zones of the firebox and in the two outside rows of the back head.

A feature of these boilers is the unusually large radius, 15 in. in the back head corners.

The boilers are arranged for a Coffin Style 4, 63-unit superheater with a dome throttle valve operated by a rod through a back-head stuffing box. A Coffin Type D feedwater heater, together with two Ohio 10,000-gal. live-steam injectors, supply boiler feed water. The boilers have three Nicholson syphons, two in the firebox and one in the combustion chamber and the coal burning locomotives have, in addition, two 3½-in. arch tubes between the syphons and the side sheets. The safety valve equipment consists of four 3½-in. Ashton valves. The boilers are equipped with Signal Foam Meter, TZ blow-off cocks with Okadee separator and muffler. On the coal-burning locomotives Firebar grates, Standard HT stoker and Franklin butterfly firedoor are used.

The Running Gear

The foundation of the locomotive is a General Steel Castings Corporation bed. The cylinders and valve chambers are fitted with bushings of Hunt Spiller iron. The leading and trailer trucks were supplied by the General Steel Castings Corporation. Engine and tender axles are carbon steel and all engine and tender journals are equipped with Hennessy lubricators. The main driving journals are 13 in. by 14 in. and the others are 12 in. by 14½ in. The trailing-truck journals are 9 in. by 14 in. and the engine truck journals are 7 in. by 12 in. Franklin compensators and snubbers are used on all driving wheels and the Alco lateral motion device is applied at the front driver.

The cylinders are 28 in. bore and 31 in. stroke with 14-in. piston valves having 8 in. travel. The valve gear is the Walschaert type controlled by Franklin Type E power reverse gear. The piston rods and crank pins are carbon steel with inside-lubricated hollow-bored main pins. The side and main rods are forged manganese-molybdenum steel with Mangus bushings. The cross-heads are of the multiple bearing type. The driving-wheel centers are the Boxpok type.

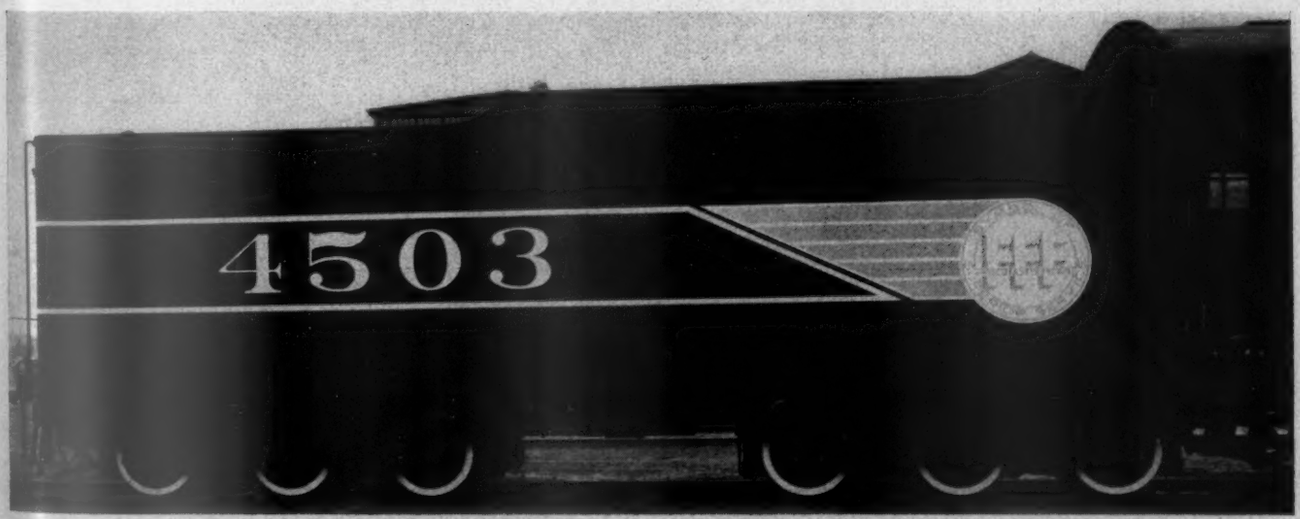
In counterbalancing these locomotives the 2,001 lb. of reciprocating weight on each side is balanced with a 601-lb. overbalanced distributed 100 lb. in the main wheel and 167 lb. in each of the other three drivers. The dynamic augment at diameter speed is 8,300 lb.

Mechanical pressure lubrication for cylinders and valves is supplied by a Nathan DV-5, 26-pint, 5-feed lubricator driven from the valve motion on the right side. Alemite grease lubrication is used at several locations throughout the running gear and Chicago flange oilers complete the equipment. The lubricator feed lines from the Nathan lubricator are ⅜-in. Bundy-weld steel tubing.

General Dimensions, Weights and Proportions of the St. Louis-San Francisco 4-8-4 Locomotives

Railroad	St. Louis-San Francisco
Builder	Baldwin Locomotive Works
Type of Locomotive	4-8-4
Road numbers	4500—4502 Passenger 4503—4514 Freight
Date built	October, 1942
Dimensions:	
Height to top of stack, ft.-in.	16-1
Height to center to boiler, ft.-in.	10-6
Width overall, in.	10-11½
Cylinder centers, in.	94
Weights in working order, lb.:	
On drivers	280,000
On front truck	79,000
On trailing truck	103,500
Total engine	462,500
Tender	275,400
Wheel bases, ft.-in.:	
Driving	19-3
Rigid	12-10
Engine, total	46-6
Engine and tender, total	92-4
Wheels, diameter outside tires, in.:	
Driving	74
Front truck	38
Trailing truck	44
Engine:	
Cylinders, number, diameter and stroke, in.	2—28 x 31
Valve gear, type	Walschaert
Valves, piston, type, size, in.	14
Maximum travel, in.	8
Steam lap, in.	1¾
Exhaust clearance, in.	⅛
Lead, in.	⅞
Cutoff in full gear, per cent	78
Boiler:	
Type	Conical
Steam pressure, lb. per sq. in.	250
Diameter, first ring, inside, in.	85¼
Firebox length, in.	132⅛
Firebox width, in.	96¼
Height mud ring to crown sheet, back, in.	84⅜
Height mud ring to crown sheet, front, in.	91¾
Combustion chamber length, in.	77
Arch tubes, number and diameter, in.*	2-3½
Thermic syphons, number	3
Tubes, number and diameter, in.	206-2¼
Flues, number and diameter, in.	63-5½
Length over tube sheets, ft.-in.	20-0
Boiler—(*Continued*)	
Fuel	12 freight—coal 3 passenger—oil
Grate area, sq. ft.	88
Heating surfaces, sq. ft.:	
Firebox and comb. chamber	407
Arch tubes	19.5
Thermic syphons	117.5
Firebox, total	544
Tubes	2,416
Flues	1,806
Evaporative, total	4,766
Superheater	1,508
Combined evap. and superheater	6,274
Tender:	
Type	Rectangular U
Water capacity, gals.	18,000
Fuel capacity, tons	12 coal burners—24 3 oil burners—6,500
Fuel capacity, gal.	
Trucks	6-wheel
Journals, dia. and length, in.	6½ x 12
General data, estimated:	
Rated tractive force, engine, 85 per cent, lb.	69,800
Speed at 1,000 ft. per min. piston speed, m.p.h.	42.6
Piston speed at 10 m.p.h., ft. per min.	234.6
R.p.m. at 10 m.p.h.	45.5
Weight proportions:	
Weight on drivers ÷ weight, engine, per cent	60.6
Weight on drivers ÷ tractive force	4.0
Weight of engine ÷ evaporative heating surface	97.2
Weight of engine ÷ comb. heating surface	73.7
Boiler proportions:	
Firebox heat. surface per cent comb. heat. surface	8.7
Tube-flue heat. surface per cent comb. heat. surface	67.4
Superheater surface per cent comb. heat. surface	24.0
Firebox heat. surface ÷ grate area	6.2
Tube-flue heat. surface ÷ grate area	48.0
Superheater heat. surface ÷ grate area	17.1
Comb. heat. surface ÷ grate area	71.3
Evaporative heat. surface ÷ grate area	54.2
Tractive force ÷ grate area	793.0
Tractive force ÷ evaporative heat. surface	14.6
Tractive force ÷ comb. heat. surface	11.1
Tractive force x diameter drivers ÷ comb. heat. surface	822.0

*On coal-burning locomotives only.



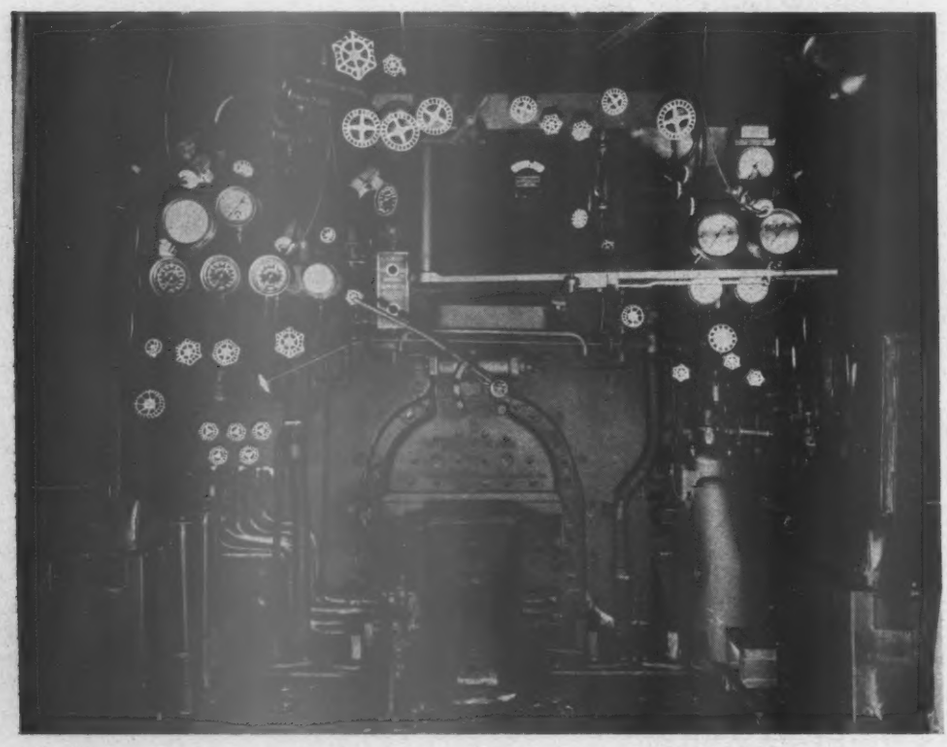
The tender of the coal-burning freight locomotive

The Tenders

The tenders have rectangular tanks of 18,000 gal. water capacity built on Commonwealth cast-steel water-bottom underframes. The tender is mounted on two

Partial List of Materials and Equipment on the St. Louis-San Francisco 4-8-4 Locomotives

Engine bed; engine- and trailing-truck frame	General Steel Castings Corp., Eddystone, Pa.
Driving and trailer wheel tires; springs, driving and trailer	Railway Steel Spring Div., American Locomotive Co., New York.
Flexible air connection between engine and tender	New York Air Brake Co., Watertown N. Y.
Flexible steam connection between engine and tender	Franklin Railway Supply Co., Inc., New York Barco Manufacturing Co., Chicago
Rivets	The Champion Rivet Co., Cleveland, Ohio
Signal Foam-Meter	Dearborn Chemical Co., Chicago
Foundation driver brake	American Brake Div., Westinghouse Air Brake Co., Wilmerding, Pa.
Brake shoes	American Brake Shoe & Foundry Co., New York
Locomotive brake equipment; air signal equipment	New York Air Brake Co., Watertown. N. Y.
Rod brasses	Magnus Metal Div., National Lead Co., New York
Lubricators, mechanical	Nathan Manufacturing Co., New York



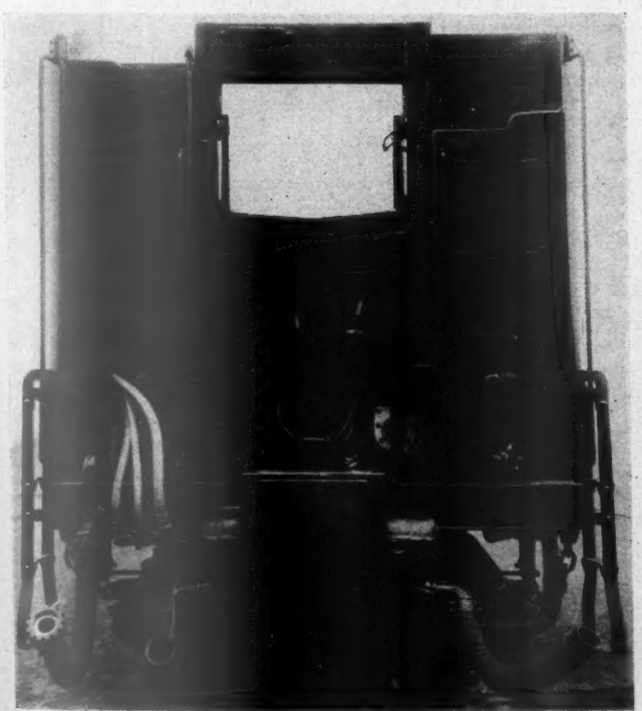
The cab interior of one of the coal-burning locomotives

Lubricators for engine and tender truck boxes and driving boxes	Hennessy Lubricator Company, New York
Axles, engine; crank pins	Standard Steel Works Division of The Baldwin Locomotive Works, Philadelphia, Pa.
Driving and truck box brasses; frame shoes; rod brasses	Magnus Metal Div., National Lead Co., New York
Lateral motion device	American Locomotive Co., New York
Driving-wheel compensators and snubbers	Franklin Railway Supply Co., Inc., New York
Pilot coupler	American Steel Foundries, Chicago
Pilot uncoupling rigging	Standard Railway Equipment Mfg. Co., Chicago
Boiler and firebox steel	Lukens Steel Co., Coatesville, Pa.
Engine-truck wheels	American Rolling Mill Co., Middletown, Ohio
Driving-wheel centers and trailing-centers; safety bar	Standard Steel Works Division of The Baldwin Locomotive Works, Philadelphia, Pa.
Radial buffer, power reverse gear	Franklin Railway Supply Co., Inc., New York
Drawbar, engine and tender	American Steel Foundries, Chicago
Jacket iron	American Rolling Mill Co., Middletown, Ohio
Boiler lagging	Johns-Manville Sales Corp., New York
Staybolt steel	Penn Iron & Steel Co., Creighton, Pa.
Flexible staybolts	Flannery Bolt Co., Bridgeville, Pa.
Tubes and flues	Jones & Laughlin Steel Corp., Pittsburgh, Pa. National Tube Co., Pittsburgh, Pa.
Cylinder and valve bushings; valve bull rings; valve packing rings; cylinder packing rings; piston heads	Hunt-Spiller Manufacturing Corporation, Boston, Mass.
Cylinder cocks; piston rod packing; valve stem packing; tank valves	T-Z Railway Equipment Co., Chicago
Piston rods; main and side rods; crossheads	Standard Steel Works Division of The Baldwin Locomotive Works, Philadelphia, Pa.
Lubricator tubing	Bundy Tubing Co., Detroit, Mich.
Flange lubricator	Ohio Injector Company, Wadsworth, Ohio
Water column	Edna Brass Mfg. Co., Cincinnati, Ohio
Running boards	Alan Wood Steel Co., Conshohocken, Pa.
Valve pilot	Valve Pilot Corporation, New York
Gage cocks	The Prime Manufacturing Co., Milwaukee, Wis.
Blower valve	Locomotive Equipment Division, Manning, Maxwell & Moore, Bridgeport, Conn.
Blower fittings	Barco Manufacturing Co., Chicago
Safety valves	Ashton Valve Co., Boston, Mass.
Steam heat reducing valve	Vapor Car Heating Co., Inc., Chicago
Blow-off valves	T-Z Railway Equipemnt Co., Chicago
Smokebox hinges	The Okadee Company, Chicago
Sander; sander operating valve	Graham-White Sander Corp., Roanoke, Va.
Syphons, firebox	Locomotive Firebox Co., Chicago
Brick arch	American Arch Co., Inc., New York
Superheater	The J. S. Coffin Jr., Company, Englewood, N. J.
Pyrometer	The Superheater Company, New York
Throttle rod packing	The Garlock Packing Company, Palmyra, N. Y.
Piping	National Tube Co., Pittsburgh, Pa.
Pipe covering	Gustin-Bacon Mfg. Co., Kansas City, Mo.
Feedwater heater	The J. S. Coffin Jr., Company, Englewood, N. J.
Injectors; injector checks	Ohio Injector Co., Wadsworth, Ohio
Blowoff muffler and separator	The Okadee Company, Chicago
Washout plugs	The Prime Manufacturing Co., Milwaukee, Wis.
Stoker	Standard Stoker Co., Inc., New York
Firedoor	Franklin Railway Supply Co., Inc., New York
Grates	Waugh Equipment Co., New York
Back pressure gages; steam and air gages	Ashton Valve Co., Boston, Mass.
Bell ringer	Transportation Devices Corp., Indianapolis, Ind.
Whistle	Locomotive Equipment Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

Cab lamps; headlight and generator; marker classification and back-up lamps	The Pyle-National Company, Chicago
Cab seat covering	Athol Mfg. Co., Athol, Mass.
Steam-heat connectors	Vapor Car Heating Co., Inc., Chicago
Tender:	
Truck wheels; axles	Standard Steel Works Division of The Baldwin Locomotive Works, Philadelphia, Pa.
Trucks	Buckeye Steel Castings Co., Columbus, Ohio
Frame	General Steel Castings Corp., Eddystone, Pa.
Air brake; air signal	New York Air Brake Co., Watertown, New York
Brake equipment	American Steel Foundries, Chicago
Brake shoes	American Brake Shoe & Foundry Co., N. Y.
Coupler	The Symington-Gould Corp., Rochester, New York
Coupler yoke	National Malleable and Steel Castings Co., Cleveland, Ohio
Uncoupling attachment	Union Metal Products Co., Chicago
Draft gear	W. H. Miner, Inc., Chicago
Coal pusher	Standard Stoker Co., Inc., New York
Safety bars	Standard Steel Works Division of The Baldwin Locomotive Works, Philadelphia, Pa.
Tank valve; washout plug	T-Z Railway Equipment Co., Chicago
Slack adjuster	Royal Railway Improvement Products Corp., Wilmington, Del.

Buckeye six-wheel trucks having 6½-in. by 12-in. journals and 36-in. rolled steel wheels. The feedwater heater is located in the right front leg of the tender tank. The stoker engine is also located on the tender. The coal space is equipped with a Standard Type DA coal pusher.

The tender brake equipment was furnished by American Steel Foundries and the trucks are equipped with



Engine-tender connections on the front end of the tender

two 14-in. by 12-in. brake cylinders. The brake is designed for a braking load of 144,000 lb. (85 per cent of light weight) at 50-lb. cylinder pressure.

Other Locomotive Equipment

The engine brake schedule is No. 8 ET and the equipment was supplied by the New York Air Brake Company. Air is supplied by two 8½-in. cross-compound compressors located on brackets at the front end. The air lines between engine and tender are Goodall semi-metallic with Franklin sleeve-joint connectors for stoker engine and steam-heat lines. Barco flexible connectors are used on the feedwater-heater steam line.

The tender draft gear is the Miner A5XB. Between engine and tender are Franklin Type E-2 radial buffers.

Reducing Weight of Diesel Road Locomotives

(*Continued from page 115*)

Tanks for lube oil, fuel and engine cooling water weigh, when made of steel about two pound per gallon. Aluminum tanks weighing one pound per gallon have given satisfactory service in railroad operation. Diesel road locomotives provide tanks for these supplies with a combined capacity of one gallon per engine horsepower. By making the tanks in aluminum, one pound per gallon could be saved or a total of 5,250 lb. for the 5,250-hp. *B* locomotive.

The aluminum sheet, structural shapes and deck used on the Pennsylvania P5-A locomotives saved 32,000 lb. per locomotive. A similar application could be made on locomotive *B* and would more than meet the requirement of 8,750 lb. remaining.

Space Saving of Small Engines

Another productive source for weight saving could be realized by arranging the Diesel engines and generators to take advantage of the reduced engine space requirements of small-bore engines. If full advantage could be taken of this space saving, the engine compartment could be made one half the length needed for the large engine installation. This might easily result in savings of an additional 100,000 to 125,000 lb. not included in the original comparison. The improvement in performance resulting from such a saving should be an incentive for a careful analysis and vigorous attempt to accomplish this result. It is obvious that weight saving by complete elimination of material not only does not add to the cost of any product but actually reduces it. Engineering along these lines pays large premiums and can make the final economic picture so attractive that new applications are justified and replacement of existing equipment may be desirable.

Conclusions

1—Weight saving in the locomotive improves all of its operating characteristics except the advantage of high tractive force at starting and for speeds up to about 20 m.p.h.

2—The greatest single weight saving can be made in the engine and can be accomplished by reduction in bore, increased rating and by the use of light materials of construction.

3—The use of small bore engines and suitable arrangement of these engines can reduce the length of the locomotive and result in additional weight reduction.

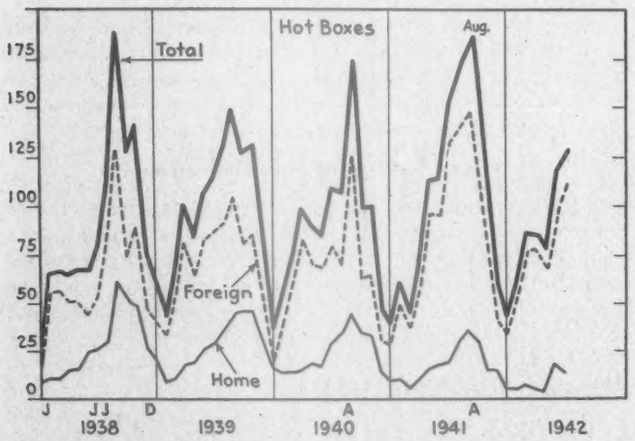
No analysis has been made of the possibilities of saving weight in the electrical equipment, air brake equipment, trucks and axles, and the locomotive frame. Unquestionably, the use of aluminum alloys as well as other material developments and design improvements would produce weight saving in these parts. The road locomotive of the future can best serve its destiny by being designed to use all of the available weight and space saving methods that can be conceived. If it results in such light weight that starting tractive force is insufficient for satisfactory train performance, ballast at a few dollars a ton will always be available.

Some Notes on Hot Boxes*

By C. B. Smith†

WASTE grabs are the primary causes of hot boxes. They are responsible for from 50 to 95 per cent of all hot boxes, increasing from 1938 to date. Sixty per cent of these occur within 50 miles of the starting point.

Waste grabs result from a disturbance of the journal packing causing it to roll up under the edge of the bearing and to work under the bearing when it is jumped off the journal by a severe shock to the car. Shock speeds upward from five miles an hour at impact will begin to move the packing. In the winter, low temperatures will cause packing particles to adhere to the rising side of the journal before the journals have warmed up, lodging



The heavy black line shows total hot boxes, the lighter line those on home-owned cars, and the broken line those on cars of foreign ownership—Boston & Maine

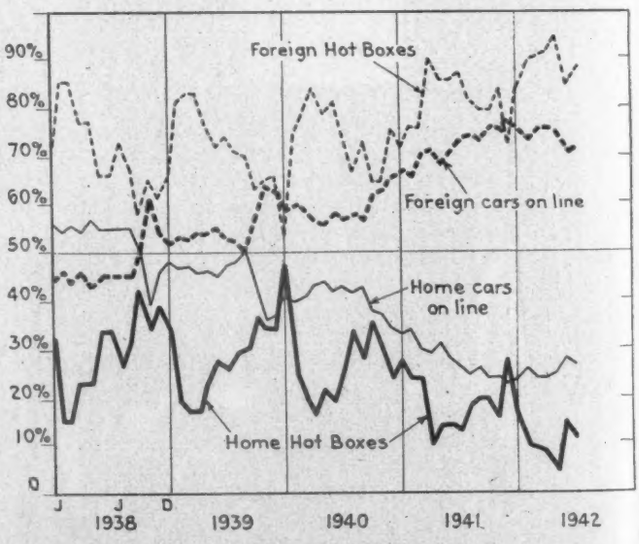
them at the edge of the bearing where they can work under it at the first shock.

The major problem to be solved in preventing waste grabs is to keep the packing from rolling up under the edge of the bearing on the rising side of the journal. Devices to accomplish this have been tried on some roads but none seem to have progressed to adoption on a large scale. One railroad system has developed such a device with which it is having encouraging success. Two pieces of wood, 1 in. shorter than the journal, 5/8 in. to 1/2 in. thick and 1 3/4 in. to 2 in. wide, are placed front and back of the journal on top of the waste packing. These pieces are connected to each other at their outer ends by a strip of steel baling tape which, when bent into position in the front of the box, holds the wooden strips and prevents the packing from rising.

Early trials with these wooden strips were not satisfactory because the pieces were nearly the length of the box and rode past the axle collar. What happened to these strips was a most convincing proof of what transpires within a box when heavy brake applications or severe end shocks occur. The axle collar jammed against the wooden strips, first denting them and finally breaking some of them, causing splinters which later worked up under the brass to drop on the packing. Some splinters were found embedded in the linings of the bearings. The present shorter pieces of wood do not come in contact with the axle collar. The device seems worthy of trial on other roads.

Study Performance

It is believed that more study could profitably be given to journal-box performances by a tabulation of failures and a graphic chart display of conditions and events from month to month. The changes and trends over long periods are very impressive and should stimulate closer attention to efforts to reduce the number of hot boxes. Such records, gathered from forms filled out by inspectors, should show the following data: number of hot boxes; freight car miles per month; mileage divided between home and foreign cars and private line cars; gross ton miles, cars on line, both home and foreign; causes of heating; percentage due to waste grabs; accumulated time of train delays and miles per hot box. Other important data to be tabulated would be: dates; car numbers and initials; train number or symbol; delay, if any; date and place of last jacking and repacking; elapsed time since repacking; whether car was serviced



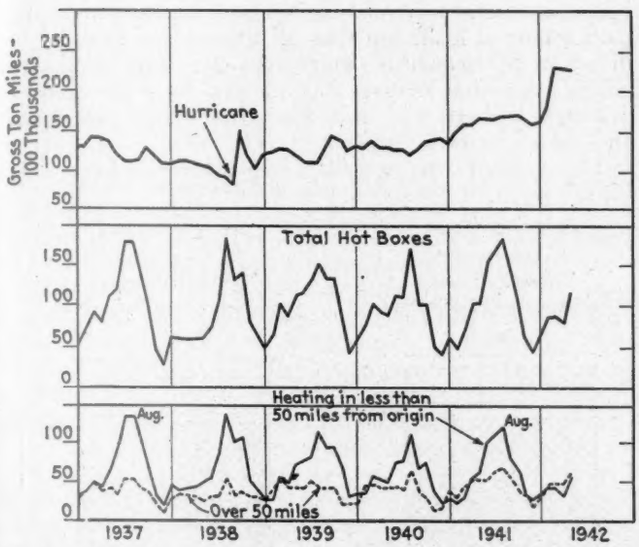
The proportion of hot boxes on home and foreign equipment is compared in this chart with the proportion of home and foreign cars on line—Boston & Maine

or not prior to train departure; starting point of car; whether car was loaded or not; distance from starting point where heating occurred; where car was set out of train; condition of bearing, packing and oil content, and any other relative data or remarks.

It has been the custom for several years on the railroad with which the author is associated to keep a monthly record of hot box analyses. These records have been charted, some of them over a period of eleven years. Similar charts prepared on other roads show that there are trends, common to all, year by year. The most im-

* Abstract of a paper delivered before the New England Railroad Club at Boston on December 8, 1942.

† Engineer of tests, Boston & Maine.



Top: Gross ton-miles—Center: Total hot boxes—Bottom: Solid line shows hot boxes occurring within fifty miles of starting point, broken line those which occurred beyond fifty miles from the starting point—Boston & Maine

pressive feature of the charts is the high peak of summertime hot boxes and the falling off from this peak toward the end of the year.

In the coldest winter weather it is customary to give attention to the starting of trains by providing men and facilities for applying a squirt of warm oil to the rising side of journals as the trains start. This assures lubrication until running temperatures develop sufficiently to supply oil for the bearing. No similar attention has been devoted generally to lower the tendency to develop hot boxes in the hot, dry summer months.

Summer Conditions the Worst

The reasons for expecting an increase in the number of hot boxes in the summer has been indicated by laboratory tests. High atmospheric temperatures narrow the range of interior journal box temperature due to the condition of the packing and oil. The dry condition of packings, as found after protracted hot spells, especially in mid-western districts, has caused excessive heating in large numbers of cars moving in trains coming from farther west.

In 1941 efforts were made successfully to reduce such heatings by applying a gill or so of water to the journal boxes. Applied on the falling side of the journal this water soaked into the packing and restored the mosture content. This procedure was used again in the summer of 1942. The plan worked until the application of water got beyond control. The use of too much water led to discouraging the practice. Restoration of moisture in packing is legitimate and reduces running temperatures. Excess applications are unfortunate. Further efforts with better controls and the education of all concerned may yet lead to the wider use of this method of handling the summer problem. Beginning with the early summer season, limited quantities of water may be applied with the oil in reclamation plants to raise the one per cent moisture of renovated packing to a known desirable amount without the danger of harmful effects in service.

The lesser number of hot boxes occurring in the winter months is probably due, in part at least, to the congealed condition of the packing before it has been warmed by friction. It is prevented from rolling up in the box so readily and, also, cars roll more slowly when humped or switched which lowers the effect of impact shocks.

Whose Responsibility?

Many conditions, either singly or in combination, can cause hot boxes in interchange freight cars. The responsibilities for them do not rest entirely upon any one railroad handling cars made up from a great variety of roads through joint interchange yards and road terminals.

It is common knowledge, confirmed by records, that the performance of journal boxes runs about the same, and has done so, year after year. No coordinated effort has been made to see what can be done specifically to reduce heating conditions all over the country. The roads have been left to solve their problems individually. This hardly seems consistent with procedures that have developed couplers, draft gears, springs, truck side frames, bolsters, etc., and officially established them by mandatory instructions.

This lack of action cannot be because hot boxes are trivial events in car operation. Little is known as to the cost of hot boxes, taking into account all of the expenses involved, some of which are difficult to evaluate. Opinions range from the hundreds of thousands into the millions of dollars annually. One figure, based on expenses observed over a period of months, indicated $40 as an approximate cost per box. Fifty hours a month in train delays were shown in the same study, and the total annual estimate of cost on this road was $20,000.

It would seem that the whole subject is worthy of the combined and coordinated study by all railroads acting under the authority and direction of the Association of American Railroads.

Free Height and Spring Cushioning Capacity

*By C. J. Holland**

A spring is a yielding member that is installed between the running gear and the body of a vehicle, because experience has demonstrated that a cushioning member is absolutely necessary to minimize the shocks due to unevenness in the roadway.

As the speed of the vehicle increases, the shock intensity increases; and therefore, greater shock-absorbing capacity should also be had. However, in the case of railroad freight cars, which carry loads from the empty car to the fully loaded car, the ideal spring condition cannot be provided, because what is ideal for the fully loaded car is altogether too stiff for the empty car. What we can do is to be sure the spring shock capacity is sufficient for the fully loaded car and yet as soft as possible for the empty car.

It is obvious that bolster spring groups are now taking extra punishment because of the heavier loads cars are carrying, the higher speeds at which they move, and also because it is impossible to keep all tracks up to normal standards, due to the increased movement over the rails and to restrictions in the supply of replacement rails and accessories. Under these conditions, the harmonic action of bolster spring groups is accentuated and bouncing often builds up and accumulates until it gets above the capacity of new spring groups.

There is no A. A. R. rule with regard to removing springs, but it is obvious that broken springs should be replaced. It is also obvious that if there are evidences of springs being driven solid, the reasons therefor should

* President, C. J. Holland Company, Chicago.

be investigated. The reason might be: (1) overloading, (2) permanent set in some of the springs, (3) lack of snubber, or shock capacity in the group.

The high-speed operation of tank cars has focussed attention upon the necessity of maintaining higher cushioning and shock capacity in their spring groups, with the result that the A. A. R. and the American Petroleum Institute agreed that snubber springs are needed in tank-car spring groups, and have issued instructions to apply snubber springs to all tank cars.

The inspector will naturally mark for replacement any springs that are broken. However, springs which have taken a permanent set are not so easy to discover. The diagram, illustrated, indicates how important it is to replace such springs. It visualizes the loss in capacity in springs which have taken different degrees of permanent set: the A. A. R. specifications for a new spring call for a normal free height of 8¼ in. In this condition the new spring has $1\frac{11}{16}$ in. of deflection or compression.

Under an empty car, the 8¼-in. springs are supposed to take a deflection of about ¼ in., which means that the distance between the top and bottom plate should be about 8 in., at which point the remaining deflection or compression would be $1\frac{7}{16}$ in. So if any of the springs in a group have taken sufficient permanent set to decrease cushioning capacity unduly, this fact can be discovered by measuring the distance between the top and bottom spring plates.

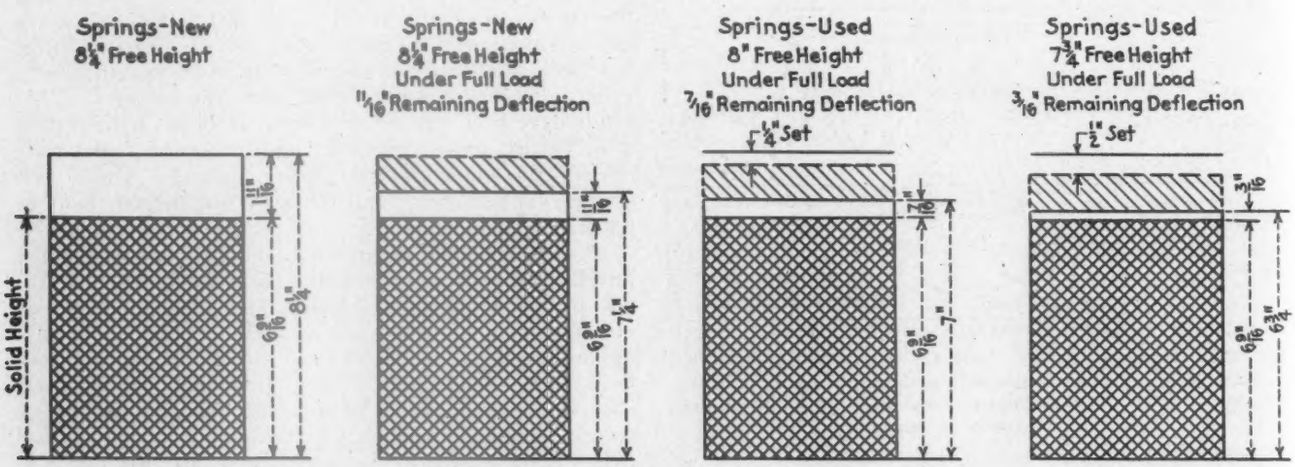
If the distance between the spring plate under the empty car is less than 8 in., one or more springs have probably taken a permanent set.

If the car is loaded to capacity, the distance between the spring plates of the nest should be 7¼ in., at which point the remaining deflection or compression is only $1\frac{11}{16}$ in. If this distance measures only 6¾ in., there is only $\frac{3}{16}$ deflection or compression remaining—and the condition approximates no springs at all.

The moral is plain. A limit in the permanent set of spring groups should be established beyond which point the springs should be taken out, and those having a permanent set should be replaced. This does not mean that all such springs must be scrapped; many of them can be reconditioned by the spring manufacturers, thus conserving materials and preventing waste.

Where one or more springs in a group have taken a permanent set, the remaining springs are carrying more than a normal load, and then all springs are likely to be driven solid frequently under capacity loads; thus imposing excessive stresses and shocks on truck frames, bearings, journals, etc., and also hastening the time when all springs must be replaced.

This indicates the necessity, importance, and economy of requiring inspection to locate shortened springs and to remove them promptly. If this is done, an important saving in delays to shipments and in bolster spring costs can be made and the safety of operation can be improved.



Effect of reduced free height on cushioning capacity of spring group

If the free height of the A. A. R. 1915 truck spring is reduced from 8¼ in. to 8 in., then under a fully loaded car (1-in. static deflection) the reserve travel left in the springs to take care of shocks is reduced by the same amount, from 11/16 in. to 7/16 in. Springs that are less than 8 in. in free height should be removed and reconditioned, if the bar diameter is not less than 1⅛ in. and has not been excessively punished by going solid. If the free height of the above spring group is reduced to 7¾ in., then under full load, the reserve travel is reduced from 11/16 in. to 3/16 in., and in this case, for all practical purposes, they are no longer springs; they are solid blocks.

* * *

DON'T WASTE
anything
★ CONSERVE
★ CONVERT
★ USE IT UP
★ MAKE IT DO
★ SAVE THE PIECES
SCRAP METAL TODAY IS PRECIOUS METAL
America's fighting forces need it for ships, tanks, guns.
The railroads . . . the nation's chief source of scrap
metal . . scientifically salvage this essential war material.
ASSOCIATION OF AMERICAN RAILROADS

The original is 14 in. by 18 in. The colors are blue, red and black

CMP and the Railroads*

By Brig.-Gen. C. D. Young†

Transportation inadequately protected by lack of representation and by weaknesses of blanket priorities system—High hopes expressed for effectiveness of CMP with ODT a claimant agency

A REVIEW of the conditions necessitating a radical change in the War Production Board in order to make a proper distribution of the scarce critical materials I believe can be made from my own personal association with the subject. I was called to Washington by Director Eastman of the Office of Defense Transportation the day before Christmas of 1941 to assume the duties of Director of Materials and Equipment and to assist in the organization of that office. It is one thing to be a part of and grow up with an organization such as a railroad; it is quite another thing to find oneself a part of an organization that does not exist and to perform duties in intimate relations with other government agencies with which he has no acquaintance and in which there is an expanding and changing personnel. Superimposed on this organization problem is the vagueness of the character of the problem. The conception of this problem had been a matter of study for more than a year under the able leadership of Ralph Budd.

Owing to the ever-increasing burdens in the broad problem of coordination and obtaining maximum utilization of domestic transportation, the organization of necessity rapidly expanded and, today, a little over one year later, the headquarters and field organization of the Office of Defense Transportation has expanded into a substantial personnel. The great majority are located in the field and are essential in order that directives may be issued and information needed be furnished with expedition and the public be properly advised without the necessity of travel to Washington.

Early Relations of ODT with WPB

At the time of the organization of ODT the present War Production Board had been reorganized out of OPM and Donald M. Nelson assumed chairmanship of the board. There was a tentative railway program for the maintenance and equipment requirements for the first quarter of 1942 which had been developed by the Civilian Supply Division of OPM in consultation with Mr. Budd's organization. Our office was charged with preparing, by the middle of February, an integrated program for all forms of domestic transportation. This was to include the requirements for all agencies of transportation; namely, the railroads; the motor truck and bus vehicles of the highways; the metropolitan area transit operations; pipe lines; the waterways of the Great Lakes, inland, coastal and intercoastal, and warehousing as it affected transportation.

With the assistance of the operators of the various forms of transportation, together with the industries supplying them with material and equipment, this program was presented and was the basis for future consideration by WPB for the 1942 requirements. The stated needs were greater than WPB felt could be allotted to domestic transportation and reductions were made in the estimates and a curtailed program granted for the full year. However, the priority system under which material was obtained was faulty to the extent that there was no assurance of a completion of the program on the schedule authorized.

Late in February I was transferred from the Office of Defense Transportation to the General Staff of the War Department, and in March, at the time of the formation of the Services of Supply, I was made Director of Procurement and Distribution for the War Department, in which office I was responsible for the purchasing, production and distribution to storage depots of all the services of the Army, such as Quartermaster Corps, Ordnance Department, Chemical Warfare Service, Signal Corps, and Medical Corps.

In this position it became increasingly evident to me that to maintain a uniform flow of materials for proper manufacturing and maintenance under the priority system, with the limited quantities of material available, some new plan of distribution to all claimants would have to be evolved. My assignment in the War Department brought me into close association with the Army and Navy Munitions Board. This Board similarly recognized the desirability of a more suitable plan of material control and as early as May, 1942, studies were initiated to improve the distribution of critical materials to the various claimants. The PRP plan came into being and this afforded some relief but it did not meet the basic problem of equitable distribution in accordance with the needs of various agencies of government and the civilian requirements, and in November Chairman Nelson inaugurated, to become effective in 1943, the Controlled Materials Plan.

Early WPB Plan Inadequate Protection for Transportation

Having left the Army to return to a new assignment with the Office of Defense Transportation as assistant director in July, it became evident to me that domestic transportation could not be fully protected under the system then in effect of having representation in WPB of the transportation equipment and material needed. In December, other government agencis having arrived at the same conclusion, a modification was made in the original plan of controlled materials by introducing, in addition to the original claimant agencies, those of transportation, petroleum, defense housing, Office of Rubber Director, Food Administrator, and Facilities Bureau of WPB.

These claimants now represented on the Requirements Committee of WPB have relieved the civilian supply of the duty of claimancy for them and by so doing present

* Abstract of a paper on ODT as a Claimant Agency in the WPB's Controlled Materials Plan presented at the meeting of the Railway Club of Pittsburgh held at Pittsburgh, Pa., on January 28.

† General Young is deputy director, ODT.

their claims directly to Vice-Chairman Eberstadt of WPB.

It is my considered judgment that the Controlled Materials Plan is fundamentally sound and as the plan becomes operative the allocation of critical materials will be expanded beyond that of steel, copper and aluminum, and the division between the Class A and Class B products will be simplified. The undertaking is so gigantic during the transitional stage from priority to allotment that the change will have to be by steps based on experience as the Controlled Materials Plan becomes effective.

Procedure Under CMP

Under the new plan the ODT, as a claimant agency, receives a determination from the Requirements Committee of a program, which program is offered in units and then resolved into material both for maintenance and equipment. In the presentation of the program it is necessary to convince the Requirements Committee of the needs as stated in the program offered. As a result of the conviction of the Requirements Committee of the efficiency of the use of the available facilities, the Requirements Committee made their determination as to the program for the first six months for freight cars and for the first six and eight months of 1943 for locomotives. Further supporting evidence has recently been presented to the Requirements Committee as it approaches a determination of the locomotives for the full year, final determination not having yet been concluded. However, under the CMP it is expected there will be an allotment in the second quarter steel production for a portion of, and perhaps all, of the last half of the year's equipment program.

The full determination of the quantities of rail for 1943 has not yet been concluded, but it is evident from the needs of the other claimants that 1943 will not see any more generous treatment than that which was accorded in 1942. In the face of this level of new rail for replacement the carriers have been required, and willingly have given, almost all of the fit rail for purposes of plant expansions and for other purposes to the government in order that the government might obtain the maximum utilization of the rail available and to provide the carriers with the new and heavier sections of rail, retiring to other government activities the fit rail suitable for the large government needs.

I am quoting from a published article by George M. Cornell, deputy director, Transportation Equipment Division, War Production Board, for by so quoting I can give you the development of the CMP as related to the requirements and production of fabricated parts. He says: "The problem of balancing supply and demand for fabricated parts, however, will require the development of some new technique. To date, supplies of fabricated parts for railroad maintenance and repair have been purchased under the provision of blanket priority ratings set up under General Priorities Order P-88 with some slight assistance on bottleneck items by means of Form PD-1A and PD-351. The only restriction on purchase has been the general limitation provision of the order regarding excess inventories. No information is at hand as to the distribution of these requirements of fabricated parts among various categories of products other than the very general classifications of Form PD-352 and these classifications include not only fabricated parts but raw materials as well. On the supply side of the picture the information available, in so far as WPB reports are concerned, is contained in the files of the PD-25A reports for railway supply manufacturers. Railway supply requirements, however, are so varied that compilation of data solely from the supply angle presents insurmountable details."

I have high hopes for the Controlled Materials Plan; it is being splendidly administered and with the cooperation of the railroads I predict that the uncertainties of the past, as regards the amount of material available to you for maintenance and new equipment will, when public announcement is made, be replaced by assurance of a supply in the future.

The Material and Equipment Requirements Division of ODT is available at all times for service to the procurement officers of the railroads for whatever information and assistance they desire. We invite their questions, comments and criticisms and request that they be placed in writing so that they may be given immediate and serious consideration without the danger of the misunderstanding which does occur from oral statements.

* * *

Pressure-treated lumber increases car life

Before construction with pressure-treated lumber, these cars, used in hauling wet wood chips to the pulp mill of the Longview Fibre Company at Longview, Wash., had a maximum service life of only four or five years—This was caused by rapid decay of untreated lumber at joints and around the floor—Spontaneous heat generated in the wet load further accelerated the activity of the decay fungi—With the use of treated lining and framing material in reconstruction, this company has more than doubled the life of its chip cars—The two above are part of a fleet of 48 operated at Longview and built with Wolmanized Douglas fir.

EDITORIALS

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You Tell Us!

We must utilize every possible manpower-hour and day in the mechanical departments of our railroads. Men will remain away from work for one reason or other. Even in normal times these absences upset work schedules and operations, but today, with the shortage of skilled help and when the railroads are stressed to the very limit to keep the boys at the front supplied and at the same time to meet our civilian needs, the loss of even one manpower-day at a critical point may have serious results—let alone the loss of many manpower-days at many places. *How can we reduce absenteeism to a very minimum? What practical suggestions have you to offer?* Drop a letter to the Editor and let's see what our roundtable will develop; your letter must be in our New York office not later than March 16 for use in our April issue.

• • •

Hot Box Elimination

Elsewhere in this issue appears an abstract of a paper presented before the New England Railroad Club by C. B. Smith, engineer of tests, Boston & Maine. Over a period of many years Mr. Smith has been a close student of the hot-box problem. Approximately six years ago he addressed the same organization on this subject and in the present paper has brought the record up-to-date. Most significant is the indication which he gave that the over-all picture had not improved appreciably in that period.

Mr. Smith acknowledged that there had been various methods pursued by individual roads, by the A.A.R. and by specialty manufacturers to improve performance but indicated his belief that the subject was not one which could be adequately covered or efficiently dealt with in any but a completely coordinated manner. He suggested what appears to be the best plan of action. Attack the problem as a common one; deal with it in the same manner as couplers, draft gears, springs, side frames, bolsters, etc., have been dealt with in the past. Only by so doing can adequate performance records be assembled and from them determinations made of what is necessary to overcome a major and expensive problem on every railroad. While the frequency of hot boxes per journal mile is very low it is probable that it can be still further reduced by careful and coordinated study and effort.

In the meantime, only one other thing can be done, each railroad must endeavor to improve its present performance. A further suggestion would be that it attempt to make known as widely as possible any methods which contribute to better performance.

More Intensive Use of Locomotives

The particular conditions essential to maximum locomotive utilization have been widely studied and publicized, but it is difficult to give too much consideration to this important subject. In discussing it at a recent meeting of the Western Railway Club in Chicago, the point was made that improvement in the metallurgy of firebox steel, boiler tubes, etc., have made possible greatly increased miles between general repairs or heavy boiler work, thus making locomotives available for road service a higher percentage of the time. In this connection, the need for a higher quality of workmanship in boiler construction and maintenance is apparent in order to overcome certain difficulties now being experienced with boiler shell and seam cracks which are apparently not chargeable to defective material.

Improvements in the technique of boiler-water treatment are also credited with contributing to successful

long locomotive runs and extending the period between washouts, also reducing the development of scale and pitting on flues and firebox sheets with attendant substantial reduction in out-of-service time of locomotives for boiler work. There is still apparently a difference of opinion regarding the advantages and disadvantages of applying copper ferrules between flues and flue sheets, nevertheless most railroads have developed a technique which practically eliminates leaking flues, a former prolific source of trouble, expense and delay in connection with the operation of locomotives.

Discussion at the meeting referred to emphasized again how much can be accomplished in the way of quicker servicing of locomotives at intermediate terminals, primarily by the relocation of coal and water stations. It was stated that on the main line of the Chicago, Burlington & Quincy between Chicago and Denver, for example, the installation of modern coal shed, water crane, and cinder-handling facilities at strategic points permits locomotives to be coaled, given a full tank of water, fire cleaned and ashpan cleaned in from four to six minutes, where this servicing attention formally required 15 to 20 minutes. A modern heavy 4-6-4-type locomotive consumes approximately 137,000 gals. of water and 85 tons of coal on the round trip between Chicago and Denver, and the problem of supplying this large amount of fuel and water is a very real one. The intensity of locomotive use on this particular railroad is indicated by the fact that with a total performance of approximately 3,000,000 locomotive-miles a month, almost 23 per cent of this mileage is made by a fleet of modern steam locomotives which are only 7 per cent of the steam locomotives owned.

The Manpower Problem

Industry and transportation in this country are being seriously handicapped by the shortage of manpower. The problem in the coming months will not become any easier with the demands that are being made for men by the armed services, and the fact that the farmers must be supplied with labor during the growing and harvesting seasons if we are to be assured an adequate supply of foodstuffs. A man-hour saved by doing the job in a better way is worth just as much, or more, than if it is necessary to secure that additional man-hour by adding to the working force.

There are many ways in which manpower can be conserved and used to better advantage. We have referred elsewhere to the problem of absenteeism. It is significant, also, that the railroads, as well as industry, are giving more and more attention to the training and improvement of supervision, in order that through better administration and direction the available manpower may be used to the best possible advantage. Statistics are not available, but a considerable percentage of the executives and supervisors are today taking advantage of various types of training courses, in order to improve their leadership ability; in other words, they are trying to find how to get a better job done, with the expenditure of the same or fewer man-hours.

The Erie Railroad, as an example, has adapted a method devised by the Training Within Industry Division of the War Manpower Commission, for training its officers and supervisors in better methods of teaching the employees under their jurisdiction as to the most effective way in which to carry out their duties. From last accounts there were at least 2,000 supervisors taking this instruction on that railroad. On the New York Central about 3,000 supervisors are enrolled in somewhat similar courses. The supervisors and employees of that system are also taking advantage of courses sponsored by State Departments of Vocational Training and other foremanship training courses promoted locally. Many of its employees are enrolled in special college courses sponsored by the United States Office of Education.

These are only two of a number of roads whose supervisors and employees are striving earnestly to take advantage of study and discussion courses, to help them to make the best use of the available manpower.

Insuring Power Supply

Electric power travels over wires from the generator to the point where it is used. Somewhere along the way there are almost always transformers. Being static devices, transformers receive little attention. Actually they do not need much, but they should receive some, since the many thousands which the railroads have in service represent a large investment in strategic materials, notably copper, steel, insulation and oil, and they are essential for continuous power supply.

Observation of a few simple rules will practically eliminate the possibility of a transformer failure. The first rule is to read carefully and follow the instructions accompanying the equipment, before installing it. Periodic tests during operation should include checking the oil level, and noting the difference between the temperature of the air and that of the transformer. Too high a temperature usually means overload. Overheating may also be caused by sludge in the cooling coils of water-cooled transformers. This may be removed by filling them with equal parts of hydrochloric acid and water for an hour, after which they are thoroughly flushed. Oil sludge on core or cooling coils may also be a reason for excessive temperature. If the air temperature is above 104 deg. F., the transformer should not be required to carry full rated load.

In time it is almost certain that moisture will get into transformer oil. Every six months to a year, a sample of the oil should be given a dielectric test. For railroads not equipped to do this, the manufacturers maintain a service at a nominal cost. If the test indicates moisture in the oil, it can be filtered at a manu-

facturer's local service shop. Moisture in the coils may be removed by heating with low-voltage current or by blowing hot dry air through the transformer after the oil is removed or by drying the core in an oven. Spare transformers require maintenance just the same as transformers in operation.

There is nothing in these suggestions that is not in the possession of any railroad, but in strenuous times like these it is easy to overlook what someone has called "tremendous trifles."

War Materials From Railway Shops

Since transportation is such a fundamental factor in the manufacture and delivery of all materials to the fighting front, railroads are making a great contribution to the war effort in carrying on their ordinary operations of periodic servicing, maintenance and repairing of both cars and locomotives. In all probability, a general survey would show that railroads are also manufacturing and turning out at local repair shops a far greater tonnage of war materials such as gun mounts, tank parts, etc., than is commonly appreciated. It is obvious, therefore, that maximum railway shop production is more essential now than ever before and amply justifies reviewing present machine equipment, shop operating methods and personnel organization with a view to discovering weak points and making the changes required to give increased output.

In this connection, it is interesting to note that a progressive manufacturer of commercial forgings recently installed a number of drop hammers ranging from 6,000 to 20,000 lb. capacity, together with dual furnace equipment for each hammer, and trimming and straightening presses for the manufacture of accurate drop-forged machine parts. He provided mechanical handling equipment for the movement of raw materials, finished parts and scrap, the latter, which includes flashing, butt ends, etc., being loaded directly into railway cars for daily return to the steel mills. Straight line production methods are used for progressing both raw materials and finished parts through the plant and by the broader use of labor-serving equipment, the production of the plant has been increased about four times while man-power requirements have been increased only two and one-half times.

A special feature of the new plant equipment is the provision for all heating and heat-treating operations to be under complete laboratory control with chemical and metallurgical determinations and also photo-micrograph studies of test bars to give immediate information regarding all phases of the manufacturing process. Particular attention may also be directed to the new types of inspection equipment which were installed for making surface determinations, including a new luminous Magnaflux test department.

The question may well be raised, Why are railway men interested in a high-production plant such as that mentioned, where only a relatively few different kinds of parts are manufactured in great quantities? The answer is that forward-looking ideas incorporated in these plants may sometimes be adapted, to some degree at least, in railway shop operations and moreover almost any large railway shop does a certain amount of manufacturing work in which a sizable volume of locomotive or car parts has to be produced. When, in addition to this work, railroad shops are required to turn out certain war materials in greater or less quantities, it is obvious that railway shop managements and supervisors are failing in duty to their country, their railroads and themselves unless they become thoroughly familiar with the full possibilities of modern shop production methods and apply these methods insofar as practicable to the work in their respective shops.

New Books

ENGINEERING MECHANICS. *Published by Longmans, Green and Co., Inc., 55 Fifth avenue, New York. 252 pages, illustrated, 5½ in. by 8¼ in.; cloth bound. Price, $4.50.*

This is a compact book of eleven chapters, British in origin. The treatment is both mathematical and graphic. The first four chapters deal with velocity and acceleration; the fourth is devoted wholly to acceleration diagrams. One chapter is devoted to force, torque, work and energy, and another to simple harmonic motion. Between these is one dealing with dimensions and dynamical similarity, in which is developed the principles of dynamical similarity and the application of this useful tool to problems of the determination of indices in formulae. The remaining four chapters are on analysis of cams; Motion of Rigid Bodies in Two Dimensions; Vibrations, and Deflections of Beams. Throughout the book the principles are illustrated by practical examples, to which the answers are given at the end of the book.

LET'S WRITE GOOD LETTERS. *By Sherman Perry. Published by the American Rolling Mill Co., Middletown, Ohio. 176 pages, 8¾ in. by 5⅜ in. Bound in Cloth. Price, $1.00.*

This short text book on business letter writing, like its successor, "Making Letters Talk Business," first published in 1924, is a practical guide to the principles of composition and mechanics of writing. The first part of the book suggests, and illustrates with good and bad examples, ways to make the content of business letters clear and effective, yet concise and tactful. Separate short sections deal with words, phrases, sentences, paragraphs, and organization of thought. Nearly half the book is devoted to practical rules and useful suggestions for the secretary and typist, including a concise summary of good business usage and a review of "essential English." Following this is a chapter on "Essentials of Report Writing," a subject important to anyone whose activities include correspondence.

THE READER'S PAGE

Brake Shafts Cannot be Welded

TO THE EDITOR:

We note on page 40 of the January, 1943, issue of the *Railway Mechanical Engineer*, an article in relation to building up worn brake shafts by welding. We realize the savings that could be accomplished by employing this operation, but if you will refer to the A.A.R. Code of Rules governing the interchange of traffic, effective January 1, 1943, rule 23, you will note that the welding of brake shafts is not permissible and the item in question is not further qualified that building up worn surfaces is permissible and which specific qualification would be necessary to permit the building up of worn surfaces on brake shafts.

A. R. GREEN,
Supervisor car maintenance,
New York, Ontario & Western,
Middletown, N. Y.

[The statement in this letter is entirely correct. Not only do the A.A.R. rules prohibit this practice but the regulations of the I.C.C. governing safety appliances state specifically that brake shafts shall be 1¼ in. in diameter without weld.—EDITOR.]

Conflicting Views About a Boiler Patch

TO THE EDITOR:

I note with interest the boiler patch as described on pages 385 and 386 in the September, 1942, issue of the *Railway Mechanical Engineer.*

An examination of this patch reveals that the efficiency in the outer row of rivets at the 4-in. pitch is:

$$\frac{4 - 1\frac{1}{32}}{4} = 74.2 \text{ per cent}$$

The factor of safety, according to the formula:

$$\frac{TS \times t \times E}{r \times P} = 3.19$$

where TS = minimum tensile strength = 55,000 lb. per sq. in.
t = shell thickness = ¾ in.
E = efficiency = 74.2 per cent
r = radius of boiler = 42⅝ in.
P = steam pressure = 225 lb.

If the efficiency is considered from this viewpoint, then the patch should have two additional end rivets as shown in the drawing. The efficiency then becomes:

$$\frac{4 - 1\frac{1}{32} \times .75 \times 55{,}000 + 1\frac{1}{32}^2 \times .7854 \times 44{,}000}{4 \times .75 \times 55{,}000} = 96.4$$

The corresponding factor of safety is:

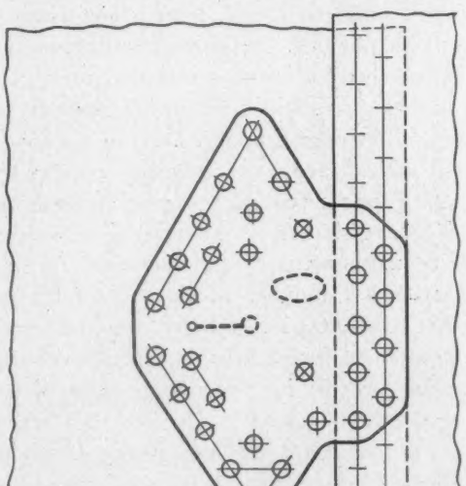
$$\frac{55{,}000 \times .75 \times .964}{42.625 \times 225} = 4.14$$

E. L. VOHL,
Special engineer,
Gulf, Mobile and Ohio,
Jackson, Tenn.

[This letter was forwarded to L. R. Haase, master mechanic, Baltimore & Ohio Terminal, Chicago, who had contributed the original paper. His reply follows.—EDITOR.]

TO THE EDITOR:

I do not agree with Mr. Vohl's method of figuring the efficiency of this boiler patch due to the fact only two 1$\frac{1}{32}$ in. holes are drilled along a horizontal line and in



Are additional rivets shown in this sketch necessary?

this particular case it is unnecessary to figure the efficiency at this point and not necessary to have an additional rivet at each end of the patch as shown on your sketch.

It has always been considered good boiler practice that you could drill a maximum of three holes in a row before considering the efficiency. For instance, boiler braces for either front or back flue sheets or the throat sheet have three holes drilled in the shell in a horizontal plane and we do not consider this efficiency.

Of course, if a series of holes are drilled in a horizontal line in the shell of a boiler it would tend to weaken the plate and, in turn, would decrease the efficiency of the shell to such an extent that it would be less than the longitudinal seam, in which case, the lower efficiency would be used.

L. R. HAASE,
Master mechanic,
Baltimore & Ohio,
Chicago Terminal, Chicago.

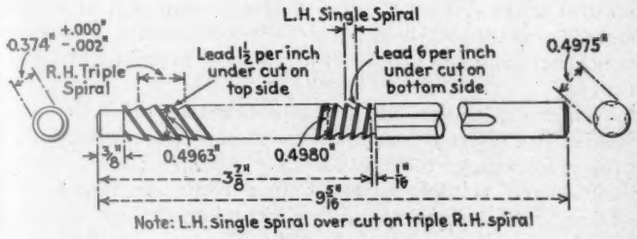
IN THE BACK SHOP AND ENGINEHOUSE

Spiral Reamer To Straighten Holes

Straight holes in which the axis is not permitted to be bowed more than 0.0001 in. in 4 in. can be obtained with a fast spiral reamer developed by Howard Fancher, a methods man at General Electric's Schenectady Works.

The reamer enlarges the hole approximately 0.002 in. It is especially useful in producing straight holes through which rows of cross holes have been drilled.

The tool can be made easily, its cutting edges hold up well, and sharpening is not difficult. The left-hand



Spiraled diamond-cut reamer

spiral flutes are shaped like a buttress thread. One-, two-, and three-flute reamers have been used.

The lands are interrupted by a right-hand triple-spiral flute with 1½ threads per in. The lands are not relieved and it has been found that up to 0.012 in. width of land is permissible.

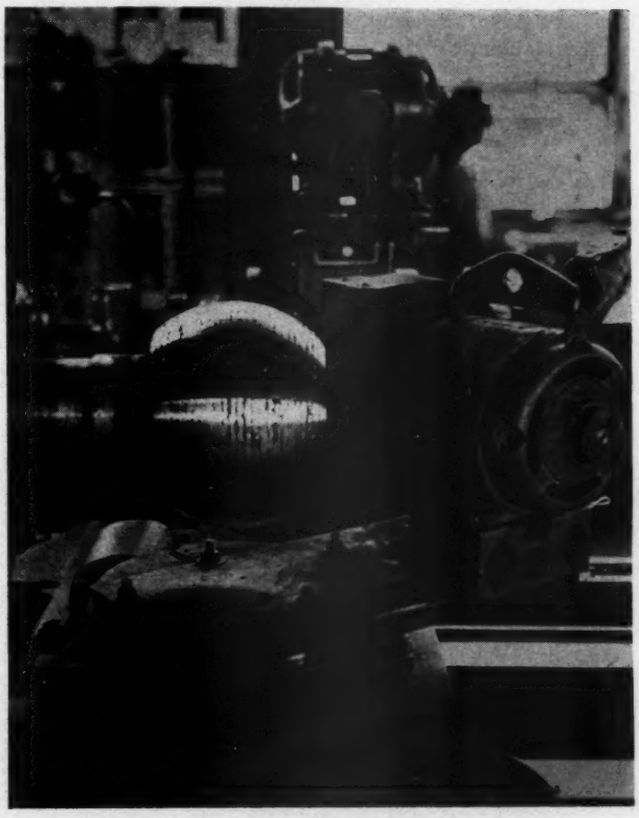
The radial face of the left-hand spiral flutes is toward the starting end of the reamer. This space is ground with a 5-deg. positive rake. Only ¼ in. of length of the reamer is straight and to the required size. The next 2-in. portion is tapered 0.0017 in. smaller toward the starting end. The next ¾-in. portion is tapered 0.0003 in. smaller to the starting end of the reamer.

Both the straight and the tapered portions of the reamer are cylindrically ground. The fluted shank, which acts as a back pilot or guide, is cylindrically ground 0.0005 in. smaller than the finish diameter of the reamer teeth. The flutes in the shank facilitate the flow of cutting oil to the reamer.

For a reamer in the neighborhood of ½ in. in diameter, a left-hand thread of six threads per inch, and a triple right-hand thread of 1½ threads per in. have been found satisfactory.

Grinding Spherical Surfaces

After rebuilding flexible radius-bar balls with a hard-facing welding rod the Southern Pacific, at its El Paso shops, grinds the surfaces to proper size in a jig which consists of a circular milling attachment bolted to a plate which is fastened to a lathe cross-slide and which has a plate bolted on top of the milling attachment. A



Jig for grinding spherical surfaces

portable motor-driven grinder is mounted on this top plate. The circular feed of the grinding wheel is obtained by gearing the circular milling attachment to the gear on the lathe cross-feed screw.

How to Increase the Life of Worn-Out Tools

*By J. S. Gillespie**

When your high-speed steel cutters are "worn out," don't scrap them. They are still good—on the same job—usually for several times the original life of the tool.

The simple way to reclaim these tools is to braze tips of Carboloy to the cutting surface of the tool, letting the tip project slightly beyond the edge of the tool and then grinding the tool to size. When the tools wear undersize—they will probably take a lot longer to do this than did the original tools—they can be brought back to size by moving the tips out slightly. To do this, heat the tips until the braze is loosened and then move them out enough for regrinding.

This procedure of tipping high speed-steel tools may

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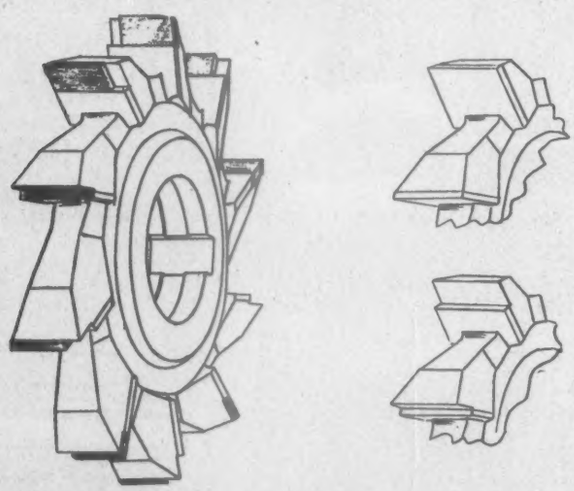
be followed, as a matter of fact, not only for the purpose of reclaiming such tools when they are worn out but actually before the tools are completely undersize. Even new tools in stock may be tipped when it is desirable to convert operations immediately to carbides for increased production.

The process has the advantage of greater tool economy. It usually costs less to tip a tool with carbide than to buy a new steel tool and the tipped tool lasts longer. Furthermore, the practice conserves strategic tungsten, since an ounce of tungsten in a carbide tip will do the work in many cases of several pounds of tungsten in other forms of cutting tools.

Grinding the High-Speed Steel Tool

The actual procedure in reclaiming a multiple-point tool is first to grind back the faces to which the tips are



This sketch suggests how worn-out cutting tools may be reclaimed by the use of small carbide tips

to be brazed. The depth to which these faces are to be ground depends on the thickness of the tip to be used. During brazing, the tips should be placed so that they line up.

It is not necessary to grind a recess for the tip. The latter may be brazed to a flat surface, since tool loads are rarely so great as to demand a support around the tip.

The prime difference between tipping an ordinary steel shank and a high-speed steel shank with carbide is that greater care has to be taken to prevent oxidization. When you heat high-speed steel, there is a tendency for the chrome contained in the steel to be driven out.

If the chrome is allowed to oxidize, it forms a coating to which it is difficult to make a braze adhere, since standard brazing compounds will not wet chrome oxide properly.

To overcome this is not difficult, however. The main things to observe are that the shank shall be heated quickly and no more than necessary, and that plenty of flux be used to keep the chrome from oxidizing. It also helps to move the tip with a rod if possible when the shank is heated to help wet the steel surface with the Easy-Flo No. 3.

Brazing

When the tip is brazed to the shank, it is allowed to stick out slightly over the edge of the steel. After all the tips are brazed in place, the complete tool is then re-ground to the proper diameter, etc.

When the tool wears down in service, to bring it back to size it is necessary merely to apply heat to the tool, loosening the braze, move the tips out slightly, and allow the braze to set again. The tool is now re-ground to proper size. This procedure can usually be repeated several times during the life of the average tip, and tips can be replaced with new tips when necessary. In this way the original life of the tool is multiplied many times.

While the preferable method of brazing tips to steel shanks is to heat the shank rather than the tip, it is necessary sometimes to heat through the tip to keep previously-brazed closely-adjacent tips from coming loose. When this is done, care should be taken to heat the entire tips evenly to prevent cracking due to uneven expansion of the carbide.

With short tips a conventional braze is entirely satisfactory. Where tips are relatively long, however, it is usually better to employ a sandwich braze in which a sheet of constantan is placed between layers of Easy-Flo No. 3. This helps relieve brazing strains due to possible uneven cooling and the difference in expansion and contraction between steel and tungsten carbide.

In heating either through the shank or the tip it is desirable to use a torch small enough to concentrate the heat where needed and large enough to provide effective heating of the entire areas desired. The tip, Easy-Flo No. 3, and flux should be in place before the heating is begun, to avoid oxidizing.

This tipping procedure is being currently followed for such wide ranges of tool classifications as conventional milling cutters, reamers, counterbores, side mills, core drill, spot facers, fly cutters, end mills, etc.

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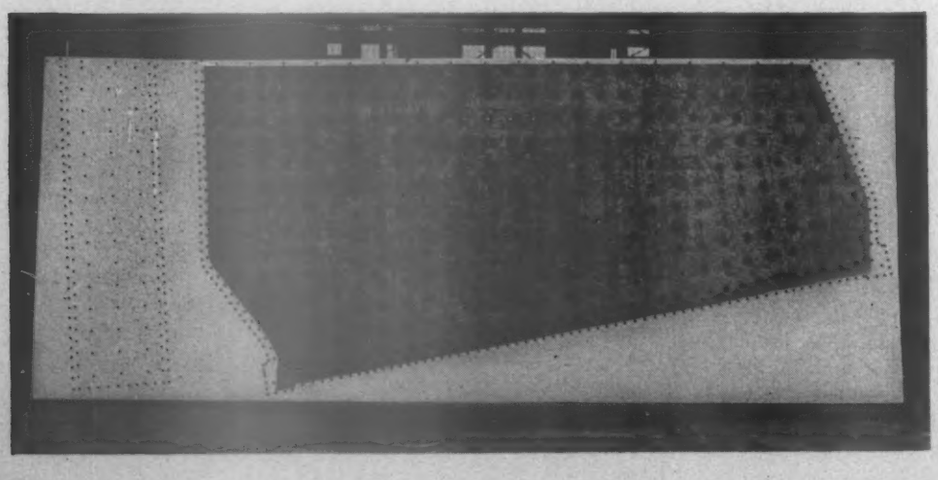

Type of template used in laying out half side sheets for locomotive boilers at the Louisville & Nashville shops, South Louisville, Ky.

Flues Without Copper Ferrules*

Part I

By S. Christopherson†

A study of methods and results of setting tubes directly against steel sheets

Too often flue-shop machinery is obsolete or inadequate and poorly arranged. Up-to-date flue-shop equipment is economical and can be purchased and installed at a moderate cost and, in a short time, it will repay the expenditure.

Service life of flues and tubes depends largely on the use of modern equipment, cleanliness of preparation, proper welding machines for safe-ending and good practice in application. The correct procedures require proper inspection of flues and tubes, flue and tube holes, a periodical check for contour and size on all tools used, and the proper handling of these tools in the working of the flues and tubes. Then the job will be done right with a minimum of time and labor involved.

The service life of flues and tubes applied without using copper ferrules has proved to be as satisfactory as in applications made with the ferrules. There may be a little more care needed in fitting flues or tubes into holes by having the right swaging done so as not to thin out the material.

Proper Practices in Use of Flue or Tube Tools

Experience on several locomotives of the 2-10-2 and 4-8-4 types, carrying boiler pressures from 200 lb. up to 265 lb., over a period of several years indicate that copper ferrules can be eliminated. There have been some cases when trouble started within 20,000 miles, but in the check-up it was found that the trouble was caused by a poor job done by the use of improper tools. We have also had the same trouble with locomotives having copper ferrules. In our estimation, one is as good as the other provided a good job is done.

With the following procedure, we feel that a good job can be done without copper ferrules. All flues and tubes removed from boilers should have the ragged ends cut off and cleaned before the tubes are safe-ended. After cleaning, whatever method is used, flues or tubes which are found to be light in weight, pitted or worn to one-third of the original thickness and weight should be scraped. This practice saves good material and eliminates failures on the road by weeding out the poor flues or tubes.

Safe-Ending Flues and Tubes

Two- and 2¼-in. flues should not, under ordinary conditions, contain more than three welds. For the duration, four welds are recommended on flues in good condition. Three and one-half and 5½-in. tubes should not, ordinarily, have more than two welds. For the duration, three are recommended. For the duration, it is recommended that, when an entire end is needed to bring flues or tubes back to required boiler length, an old flue or tube not over 72 in. in length be used as a safe-end, provided the old flue or tube is in good condition, and a new 6-in. flue or tube be added as the second weld for the firebox end.

Tools for Working Flues and Tubes Without Copper Ferrules

The straight gauging prosser, shown in Fig. 2, is used on 2-in., 2¼-in. flues and 3½-in. tubes for setting and

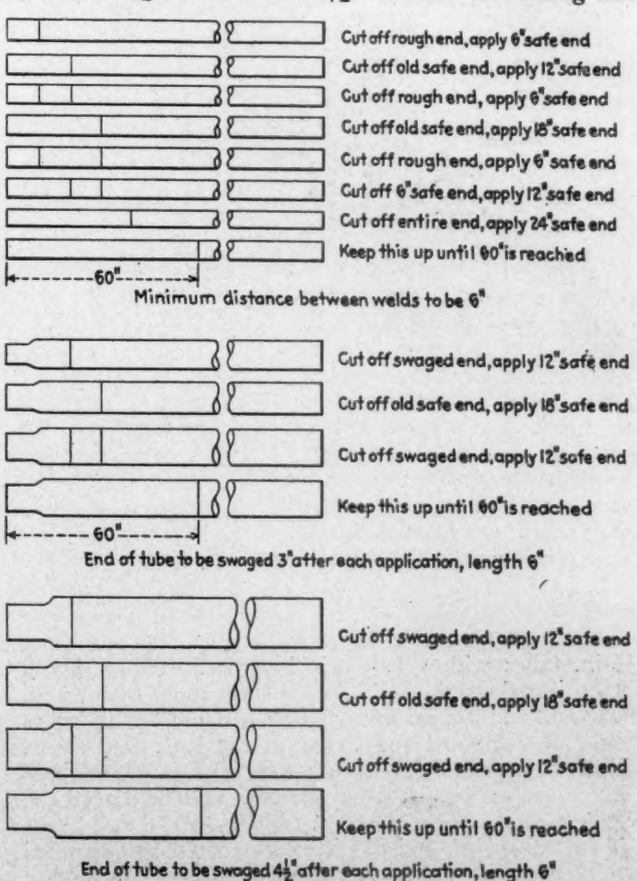
Cut off rough end, apply 6" safe end
Cut off old safe end, apply 12" safe end
Cut off rough end, apply 6" safe end
Cut off old safe end, apply 18" safe end
Cut off rough end, apply 6" safe end
Cut off 6" safe end, apply 12" safe end
Cut off entire end, apply 24" safe end
Keep this up until 60" is reached
60"
Minimum distance between welds to be 6"
Cut off swaged end, apply 12" safe end
Cut off old safe end, apply 18" safe end
Cut off swaged end, apply 12" safe end
Keep this up until 60" is reached
60"
End of tube to be swaged 3" after each application, length 6"
Cut off swaged end, apply 12" safe end
Cut off old safe end, apply 18" safe end
Cut off swaged end, apply 12" safe end
Keep this up until 60" is reached
End of tube to be swaged 4½" after each application, length 6"

Fig. 1—Safe-ending practice—Above: 2-in. and 2½-in. tubes—Center: 3½-in. tubes—Below: 5½-in. tubes

tightening. All tools should be of the railroad's adopted standard.

A flaring roller expander should be used at all points where new flues or tubes are applied, as it will save the

* Abstract of a paper submitted as part of the report of Committee on Topic No. 2 on the application and maintenance of boiler flues for the 1942 year book of the Master Boiler Makers Association.

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operation of belling over. This tool is shown in Fig. 3. The Form B modified prosser, used on 2-in. and 2¼-in. flues and 3½-in. and 5½-in. tubes after the flaring roller has been used, is shown in Fig. 4. The Form C prosser,

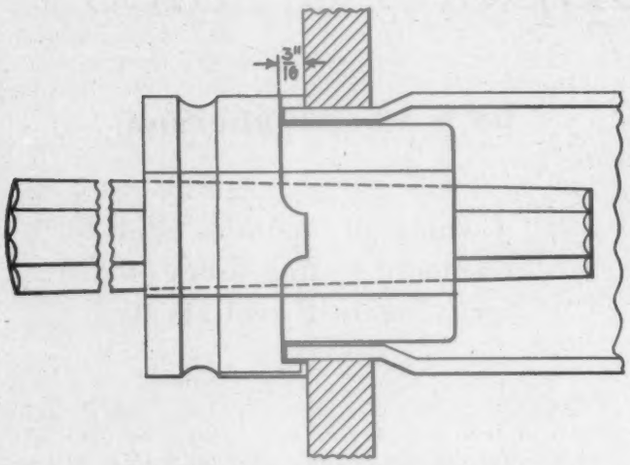


Fig. 2—Form F straight-gauge prosser

Fig. 5, is used on hot work for 2-in., 2¼-in. and 3½-in. sizes when they are leaking slightly.

In the application of flues and tubes, no oil should be used on the tools as it may get under the bead and make it impossible to obtain a good welding job. Use a good cutting compound instead.

Have the firebox end of the flue cleaned, place the flue in the hole, using Form F tool, fitting it neatly and

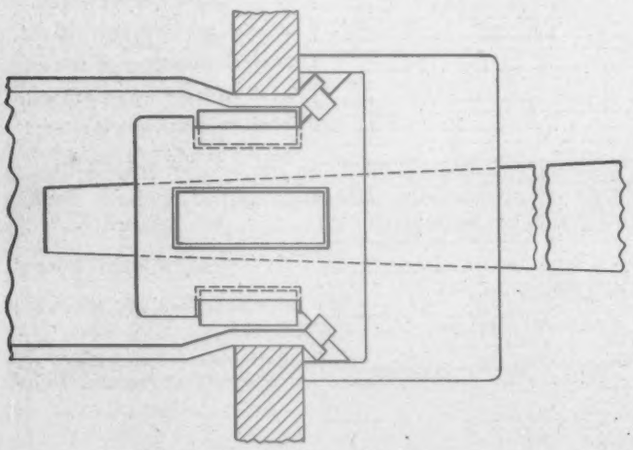


Fig. 3—A flaring type roller expander

setting it at the same time. The flue should not project through the back flue sheet more than 3/16 in. Set 5½-in. tubes with a ball pein hammer. Tubes should not project through the back flue sheet more than ¼ in.

Two-in. and 2¼-in. flues and 3½-in. and 5½-in. tubes should be tightened and flared in the back flue sheets with a roller expander having flaring rolls. Use these rollers just enough so that the flue will bell over the beading.

Two-in., 2¼-in. and 3½-in. sizes should be expanded by the use of a Form B modified sectional expander. Drive the expander pin, with pneumatic hammer, until it is fairly solid. Draw out the pin and give the expander a turn equal to a one-half section. Drive the pin a third time. This should give the full set of the expander. After expanding, examine all flues carefully. Those which have split in the recess formed by the expander or have a crack from the end of the flue into the sheet should be removed before the beading operation.

The firebox end of the 5½-in. tubes should be expanded by the use of Form B modified sectional expander. Using a No. 6 pneumatic hammer, drive the expander pin until it is fairly solid. Draw out the pin and give the expander a turn equal to one half a section. Drive the pin the second time. Withdraw the pin and turn the expander equal to one quarter of a section. Drive the pin a third time. This should give the full set of the expander.

The firebox end of all flues and tubes should be beaded. This should be done with the railroad's standard beading tool, using a short-stroke pneumatic hammer. Care should be taken to see that nothing enters between

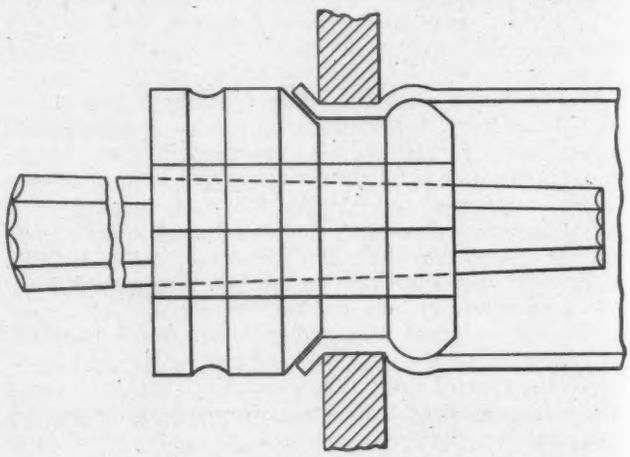


Fig. 4—Form B prosser

the bead and the flue sheet. The center line of the beading tool should always be inside the line of the flue or tube. Remove any burrs that may have formed with a small chisel and hand hammer. No beading tool should be used which does not conform to the railroad's standard.

On new sheets holes for 2-in. and 2¼-in. flues should be the same diameter as the swaged flue and no copper

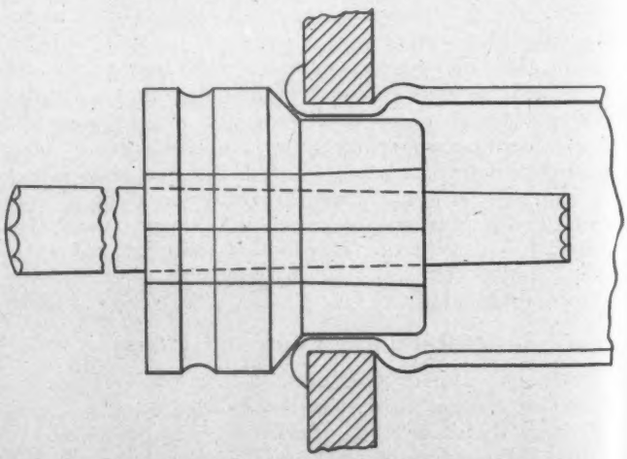


Fig. 5—Form C hot-work prosser

ferrules should be used. The flues should be swaged to 1⅞ in. and 2⅛ in., respectively.

On new sheets, the holes for superheater flues should be of the same diameter as the swaged tube. No copper ferrules should be used. The 3½-in. flues for Type E superheaters should be swaged to 3 in. The 5½-in. flues of Type A superheaters should be swaged to 4½ in.

(To be concluded in the April issue.)

With the Car Foremen and Inspectors

Rules for Cleaning and Patching Tank Car Tanks

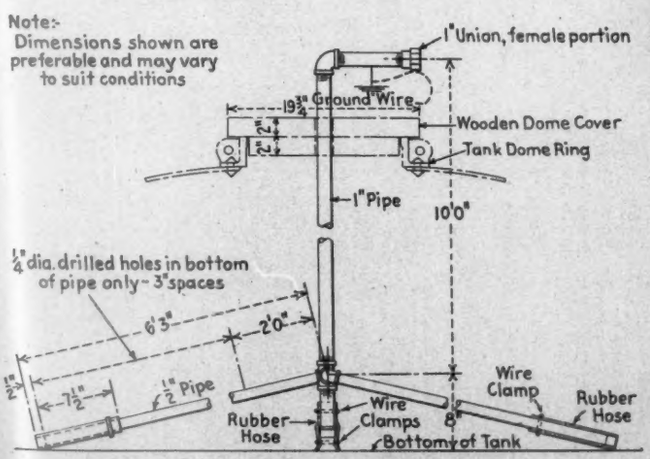
An A. A. R. Mechanical division circular, No. DV-1040, issued under date of December 15, 1942, states that in view of the present emergency situation with respect to transportation of petroleum and its products to the eastern seaboard and other critical areas and the shortage of critical materials such as plate steel, it is necessary, in order to keep the maximum number of tank cars in this service, to make repairs, wherever possible, by the application of riveted patches to riveted tanks where plates are cracked or ruptured. The following note has, therefore, been adopted to follow Interpretation No. 1 to interchange Rule 16:

"Note.—For the period of the emergency and until further advised, the requirements of Rule 16 with respect to patching of riveted tanks of tank cars are waived and will be governed by instructions for riveting patches on riveted tanks of tank cars issued in Circular DV-1040, dated December 15, 1942."

The circular includes the following instructions for the safe preparation and patching of riveted tanks of tank cars used for the shipment of petroleum products and other inflammable liquids during the emergency, these instructions having been approved by the Committee on Tank Cars and the General Committee of the Mechanical division for the benefit of railroads who have not had previous experience in repairs of tank cars.

Preparing Tank Car Tanks for Repairs

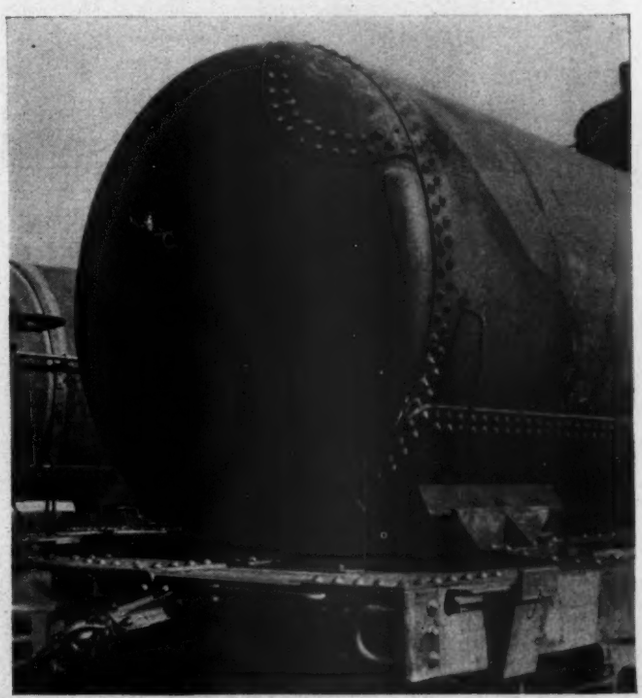
Empty tanks of cars previously used for the transportation of inflammable petroleum products such as crude oil, gasoline, kerosene, fuel oil, etc., or other inflammable liquids such as alcohol, etc., contain inflammable vapors mixed with air, forming highly explosive mixtures. No employee shall be permitted to enter any car tank previously used to transport inflammable liquids until after it has been prepared as outlined below.



Approved equipment for steaming out tank car tanks as suggested by A.A.R. Mechanical Division

The tank must be steamed with live steam for at least three hours and until warm to the touch and then flash tested to determine if it is gas free and safe for workmen to enter.

To prevent explosions, all forges and other open fires must be kept at least two car lengths away from the tank being steamed. Steaming must be performed outside of shop buildings. Employees must not smoke in or around tank cars being cleaned.



Double-riveted patch applied to double-riveted tank head of an A.R.A. Class III car

The steaming operation must be performed with the utmost care and in an economical manner. Steam should enter the tank by means of a non-sparking metal pipe, or pipe properly protected against sparking, inserted into the tank through the dome. Connection between the yard steam line and the pipe passing through the dome must be by means of a steam hose at least one inch in diameter. The steam hose must be equipped with non-sparking metal couplings.

To dissipate static, one end of a ground wire must be securely fastened to the pipe passing through the dome and the other end secured to the track rail by means of a suitable clamp to prevent its displacement. The yard steam supply line must also be thoroughly grounded. Each steam hose coupling must be joined to the coupling at the other end of the same section of hose by two wires

of suitable length for static control, as shown in one of the drawings.

The bottom outlet cap must be removed during the steaming operation and the internal outlet valve must be fully opened to allow condensation to escape. The dome opening must be closed with either a wooden cover, or heavy canvas to avoid waste of steam.

After the tank has been thoroughly steamed, preparatory to entering, it must be "flash-tested" for oil fumes by lowering a ball of burning waste into the interior by

Patch applied to the shell sheet of an A.R.A. Class III tank with single-riveted girth seams

means of the apparatus shown in the other drawing. Inserted through the dome, and lowered until it strikes the bottom of the tank, the container of burning waste is raised a few inches and allowed to remain at least a minute to prove the absences of oil fumes which would make it unsafe for a man to enter. If the waste is not burning when withdrawn, it must be relighted and re-inserted. After completion of the flash test, the burning waste is extinguished. Only a small supply of waste soaked with kerosene is kept available for flash-testing purposes.

After the tank has been satisfactorily "flash tested," and has cooled sufficiently to allow workmen to enter, it shall then be inspected. If found to have an accumulation of scale, sludge, etc., these should be removed using only non-sparking tools, or flushed out using water hose having non-sparking nozzle and couplings. If scale and sludge cannot be flushed out, it must be kept wet while being removed. Employees removing sludge and scale must wear rubber footwear while performing this work. After scale and sludge are removed, the tank shall be given an additional steaming of from one to three hours, depending upon the quantities of these items removed, to make it gas free. The tank shall then again be satisfactorily "flash tested" before employees are permitted to re-enter for any necessary repairs.

Should it be necessary to again enter the tank on the following day, the dome opening and outlet valve must be left fully open over night in order to properly vent the tank. Before any employees are permitted to re-enter the tank, it shall again be "flash tested."

Riveting Patches on Tank Car Tanks

All patches must be open hearth boiler plate steel of a quality complying with A. A. R. specification M-115. All rivets must comply with A. A. R. specification M-110 for boiler rivet steel and boiler rivets.

Patch thickness must not be less nor $\frac{1}{16}$ in. greater than the thickness of the original sheet. (a) All patches must be applied externally. The cracked or damaged area to be patched, including a section extending 2 in. beyond the defective area, shall be removed. The opening so made, whether removed by chipping or burning, must have rounded corners and the edges must be carefully chipped to provide the proper calking edge. (b) When repairing sheets with cracks only it will be permissible in lieu of the above to apply a "blind patch" in the following manner: It will not be necessary to cut out the cracked section, but a hole, of a diameter equal to the thickness of the sheet being repaired, must be drilled at each end of the crack. After being prepared as outlined, the crack must be covered with a patch, either inside or outside, meeting all requirements outlined in these instructions except for calking of the defective sheet against the patch.

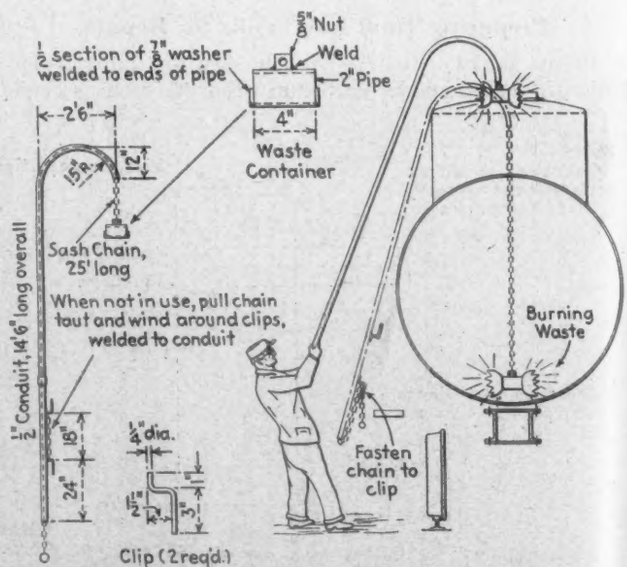
All riveting, beveling and calking must comply with A. A. R. Specifications for Tank Cars. All patch seams and rivets shall be calked inside and out. Tanks must be tested in accordance with A. A. R. Specifications for Tank Cars.

Patches applied to the shells of A. R. A. Class III, I. C. C. Class 103, A. R. A. Class IV, and I. C. C. Class 104 tanks shall be double riveted except for the plates used to close openings for handling heater coil pipes through tank heads. Patches applied to the dome head seam shall be riveted in accordance with the original construction.

Patches applied to A. R. A. Class II tanks with single or double riveted tank head seams and double riveted bottom sheet seams shall be double riveted except at single-riveted seams. Plates closing openings used for handling heater coils through tank heads shall be single riveted.

Patches applied to the shell or bottom sheets shall be rectangular. Longitudinal patch seams shall be parallel and girth patch seams perpendicular to the original longitudinal tank seams.

When the portion to be cut out extends to, or is within 10 in. of outside calking edge of the seams, the cut out



Safety apparatus for testing tank-car tanks

shall be extended to the outside calking edge, with corners properly scarfed before application of the patch.

Patches applied to the bottom sheet under slabbing or anchor shall extend beyond the slabbing or anchor a sufficient distance so that rivets will be outside the contact areas.

Machine for Forming And Rolling Brake-Shoe Keys

The brake-shoe key rolling and forming machine illustrated is used at the Atchison, Topeka & Santa Fe shops, Topeka, Kans. The machine, slightly over 11 ft. long, sets on and is bolted and clamped to a steel slab platform, supported by stands which were made from scrap main rods.

The hydraulic valve control gives a maximum pressure of 1,400 lb. per sq. in. in a 6-in. inside diameter cylinder *C* which is 61½ in. long. To the free end of the piston rod is connected the guide *G* and roller box *B*, the latter housing a series of four rollers in both top and bottom halves. The rollers are machined with disc flanges at each end, which limit the width of the keys. The dimensions of the rollers increase in size progressively from the front roller to the back one, in order to give the required taper to the keys. The lower half of the roller box works along a grooved bed, which is a heavy slab superimposed upon the platform.

A stationary guide or former *F* is keyed to the butt-block *M* at the end of the machine. A tapered tongue runs the length of this guide on both top and bottom surfaces. Dies for forming the proper radius after the two keys are rolled, tapered and cut are placed under the front end of the cylinder at *D*. They are kept open by the two coil springs which are attached at each end of the male die, and placed at each side of bed. This die is actuated when the piston is drawn backward in the cylinder.

In the rolling operation, the roller box *B* is drawn back beyond the end of the taper-tongue former *F*, and a piece of heated steel, long enough to make two keys, is centered over the end of the former. Application of pressure in the hydraulic cylinder moves roller box *B* to the right, bending the stock around the former and rolling out the stock along the taper tongue forming two keys, one on the top and one on the bottom of the former *F*. When the end of the stroke is reached, a cutting die, keyed into the guide head *G*, cuts the stock, thus making two keys in a single operation.

This machine has a production capacity of 1,000 brake-shoe keys per eight hours.

Air Brake Questions and Answers

HSC High-Speed Passenger Brake Equipment

153—*Q.—What takes place at the quick-service valve during the HSC brake application?* A.—At the quick-service valve (Fig. 18) air from the straight air pipe builds up through passage *4* and chamber *C* under the diaphragm *22*. At approximately five pounds this pressure overcomes spring *29* and deflects the diaphragm *22*, moving follower *23* and its guide. Spring *28* is compressed and seats cut-off valve *27*, closing the connection between passage *3* and the exhaust, *Ex*. If local brake fluctuation should reduce the brake pipe pressure in chamber *A*, and cause the piston and slide valve to move to application position, a reduction in brake pipe pressure will be prevented by the closed cut-off valve *27*.

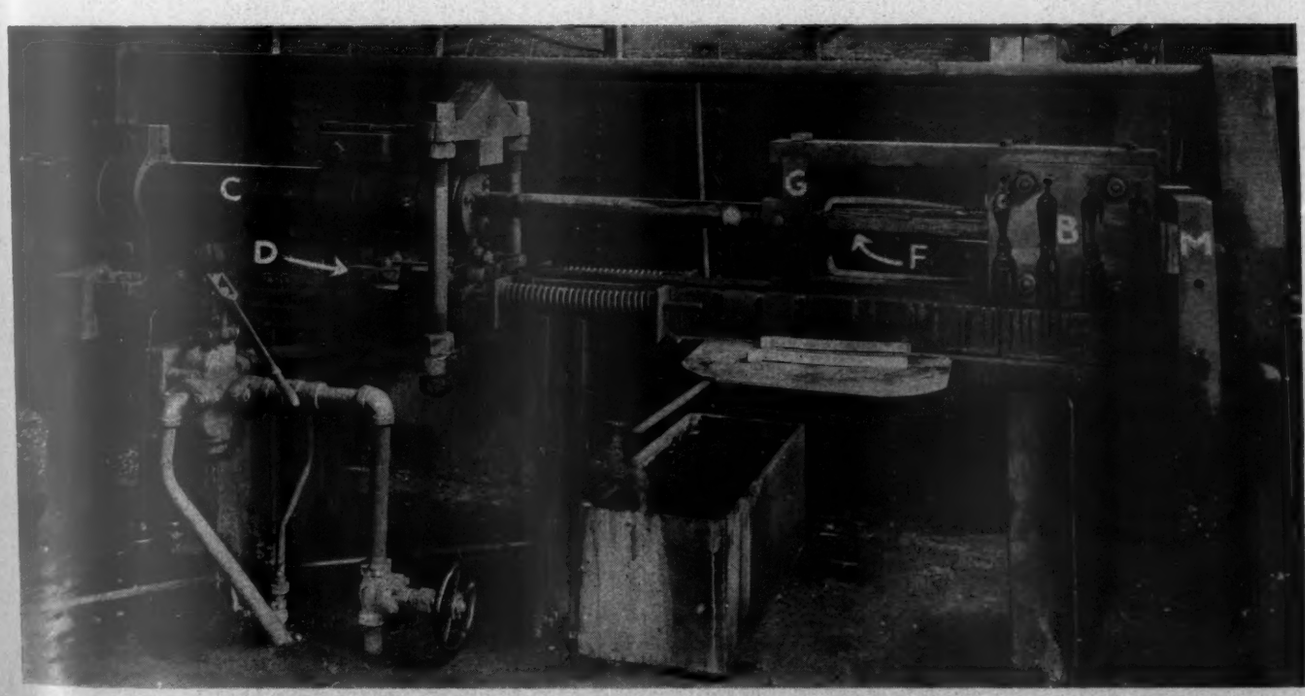
154—*Q.—How is the braking force reduced following an HSC brake application?* A.—By moving the locomotive brake valve handle toward release position.

155—*Q.—Does this fully release the brake?* A.—No. The release is accomplished by placing the handle in release position.

156—*Q.—How does the 21-B magnet valve function at this time?* A.—The release magnet valve *62* on the 21-B magnet valve is unseated at this time.

157—*Q.—How is the unseating of the release magnet valve accomplished?* A.—The master controller on the locomotive de-energizes the release wire and, therefore, the release magnet of the 21-B magnet valve. Spring *35* then unseats the release magnet valve.

158.—*Q.—What occurs at the opening of this valve?*



Brake-shoe key-forming machine which forms 1,000 keys a day at the Topeka shops of the Santa Fe

A.—The exhaust is opened so that the pressure from passage *4a*, the straight air pipe, and diaphragm chambers of the FS-1864 relay valve is reduced the same amount that the control pipe pressure is reduced on the locomotive.

159—*Q.—Explain the operation of the FS-1864 relay valve and the consequent release of brake cylinder pressure.* A.—A corresponding reduction is made in the diaphragm chambers *A, K, N* or *P*, whichever is in control. As the pressure is reduced in passages *16, 16a* and the check valve chamber, the greater pressure in the controlling diaphragm chamber *K, N* or *P*, lifts check valve *51, 51a* or *51b* and reduces into passage *16*. Also the *K-3* switch closes and disconnects the battery supply when pressure in No. 16 line is reduced to about 5 lb. As the pressure is removed from the left side of the main diaphragm *38* the higher brake cylinder pressure in chamber *F* of the relay portion and spring *42* return piston *36*, and its lever *43*. With pressure removed from exhaust valve *23* and its piston *25*, brake cylinder pressure opens them and flows to the atmosphere. After the pressure is reduced below the inshot spring valve, spring *88* returns the inshot piston *84* and diaphragm *85* and opens supply valve *92*.

160—*Q.—Is a graduated release possible?* A.—Yes. In making a graduated release the relay portions will lap and retain the brake cylinder pressure in accordance with the lapping action of the master controller as controlled by the locomotive brake valve so that the brake cylinder pressure can be released in small increments to produce a smooth stop.

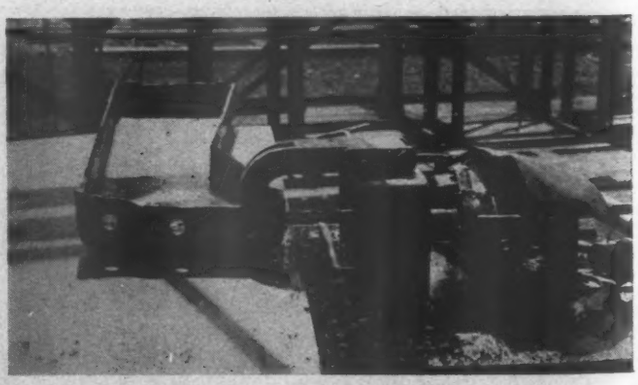
161—*Q.—How is the reduction transmitted when an emergency rate of reduction occurs, due to the movement of the brake valve handle to emergency positions?* A.—The reduction is transmitted serially from car to car.

162—*Q.—Describe the effects of this reduction.* A.—At the D-22-BR control valve (Fig. 17), the emergency rate of brake pipe reduction reduces the pressure in chamber *B*, on the face of the emergency piston. Quick action chamber pressure on the opposite face of the piston cannot reduce through the vent port *t* in emergency graduating valve *30* and port *y* in the slide valve to atmosphere at the same rate, therefore, sufficient differential is built up across the emergency piston to compress spring *49* and allow the graduating valve *30* to move far enough on the slide valve to open port *t1* in the slide valve which registers with port *t2* in the seat, allowing quick-action chamber air to flow to the face of vent valve piston *42*. The resulting movement of this piston unseats the vent valve *40*, opening a large and direct passage from brake pipe passage *1b* to atmosphere. The rapid venting of brake pipe air causes an emergency reduction rate of brake pipe pressure to pass serially and rapidly through the train, due to the same operation of connected valves, and insures the prompt movement of the valves on other cars to emergency position. The rapid reduction of brake pipe pressure causes the emergency piston and slide valve to move to the extreme right position which carries slide valve port *t1* out of register with seat port *t2*, but port *t2* is now uncovered by the tail port *t3* in the slide valve so that quick action chamber pressure remains connected to the vent valve piston. The emergency slide valve now connects the spring side of the high-pressure valve *44* to the exhaust port *Ex.*, through passage *h1* and cavity *h2* in the slide valve *29*. This vents air pressure from the spring side of the high-pressure valve, and emergency reservoir air in passage *2*, acting on the outer area of the face, unseats this valve, permitting emergency reservoir air to flow through passages *3h, 3c* and *3* to the displacement reservoir, the rate of flow being controlled by choke *21* in passage *3h*. Meanwhile, the emergency rate of reduction in brake pipe pressure has caused the service piston and slide valve to move to the extreme left where the graduating valve uncovers the service port *f*, through which auxiliary reservoir pressure flows into passage *3b* and to the displacement reservoir passage *3*, combining with the flow from the emergency reservoir. The pressure in the emergency and auxiliary reservoir, therefore, quickly equalize through passage *3* into the displacement reservoir, developing a higher pressure than obtained from electro-pneumatic or automatic pneumatic service brake application. In an electro-pneumatic emergency application from the brake valve, after the maximum brake application of 75 lb. has developed electrically, the higher combined pressures move the check valve *228* to its opposite seat, connecting the emergency, auxiliary and displacement reservoir pressure to passages *16a* and *16*, thence to the FS-1864 relay valve which operates to produce maximum brake cylinder pressure subject to speed governor regulation as described for service braking.

163—*Q.—Will an emergency brake pipe reduction from a conductor's valve or a broken brake pipe develop maximum brake cylinder pressure in the same manner?* A.—Yes, except that the electro-pneumatic brake application will not precede it. The maximum pressure is the same, however, under all emergency application.

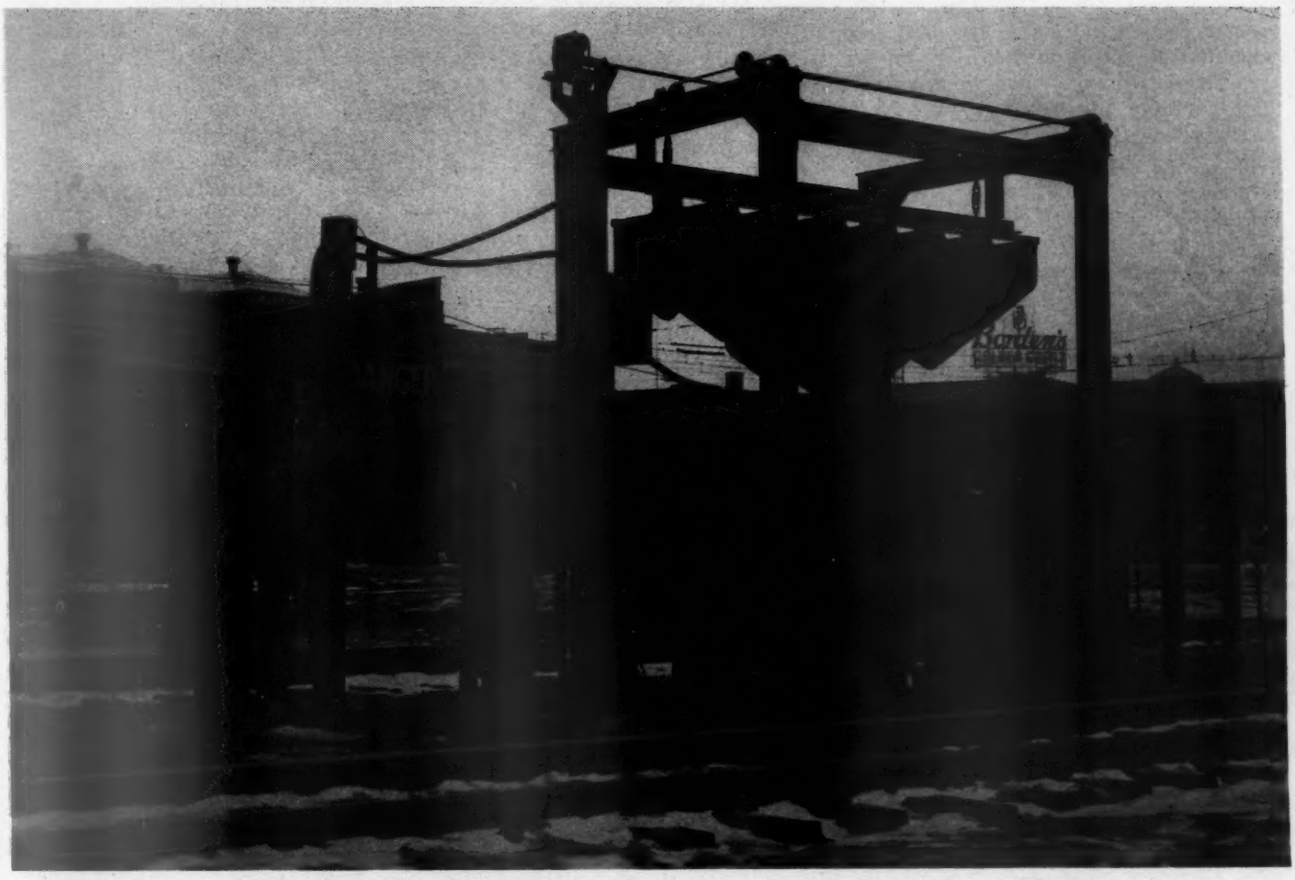
Air Motor Used in Drilling Crossbearers

A large car repair point was confronted with the necessity of manufacturing and drilling crossbearers for use in making heavy repairs to gondola cars. Machinery was available for forming these pieces but the drilling problem was not solved until the development of the drilling table and arrangement shown in the photographs. An air motor was set up in a fixed frame to operate horizontally. After having been laid out, a blank crossbearer is placed on the working table and is held in position for drilling by a drop clamping member which extends over the flange. The use of this device has contributed greatly to increasing speed in production and reducing costs per unit.



A rigidly mounted air motor serves to drill crossbearers rapidly and accurately

ELECTRICAL SECTION . .



General view of the rheostat with electrodes raised, showing the electrode suspension insulators, the circuit breaker housing and the terminal box. The man at the right is operating the hoisting mechanism —Insulators under the tank isolate rheostat from ground and permit the testing of locomotives equipped with ground detectors

Water Rheostat for Testing Diesel-Electric Locomotives

It is possible to measure engine output on a Diesel-electric locomotive by applying meters to read generator output while loading the locomotive with the brakes. This has distinct disadvantages because the load can be applied for only very short periods and is subject to fluctuations. It is frequently difficult to obtain enough track for making such a test and if the track is short there may be some hazards involved.

A much better procedure is to use a water rheostat such as the one shown in the illustrations. This was developed at the Van Nest shops of the New York, New Haven & Hartford. It stands at a convenient point in the yards; and to test an engine it is only necessary to place the locomotive on an adjoining track and connect the rheostat to the generator terminals by means of cables. A portable volt meter and ammeter are used to measure the generator output. The engine output and horsepower then equals volts × amperes × 0.001.342 × generator efficiency. Full engine load for any locomotive now in service can be maintained for any necessary time; and since the rheostat has ample capacity, troublesome bubbling or boiling at the electrodes is eliminated and a steady value of load can be held.

The rheostat consists essentially of a tank mounted on porcelain insulators and an insulated electrode which can be lowered to the required depth into the liquid in the tank. The tank, which is made of ¼-in. steel plate riveted, is 12 ft. long, 6 ft. wide and 5 ft. 4 in. deep. It is fitted with a 2-in. drain, a similar overflow pipe and is filled from a water connection or hydrant located at one end of the tank. In normal operation the tank is grounded, but the ground is removed and the insulators provide for the testing of certain locomotives equipped with ground detectors.

The movable electrode consists of an assembly of seven steel plates of varying lengths, each plate being cut to a V shape at the bottom. It is felt that very smooth increments of load are thereby obtained. The plate assembly, which hangs on two chains, is about 85 per cent counterbalanced and it may be raised or lowered by a hoisting mechanism shown in the drawings. This mechanism is self-locking and will transmit a slow movement in either direction. A fine adjustment is essential for accurate loading of the generator. The plate assembly is separated from the hoisting chain by porcelain insulators and the electric lead from the plate assembly is carried to a circuit breaker with an overload relay in a cabinet at one end of the rheostat and thence to a convenient terminal box mounted on the upright mem-

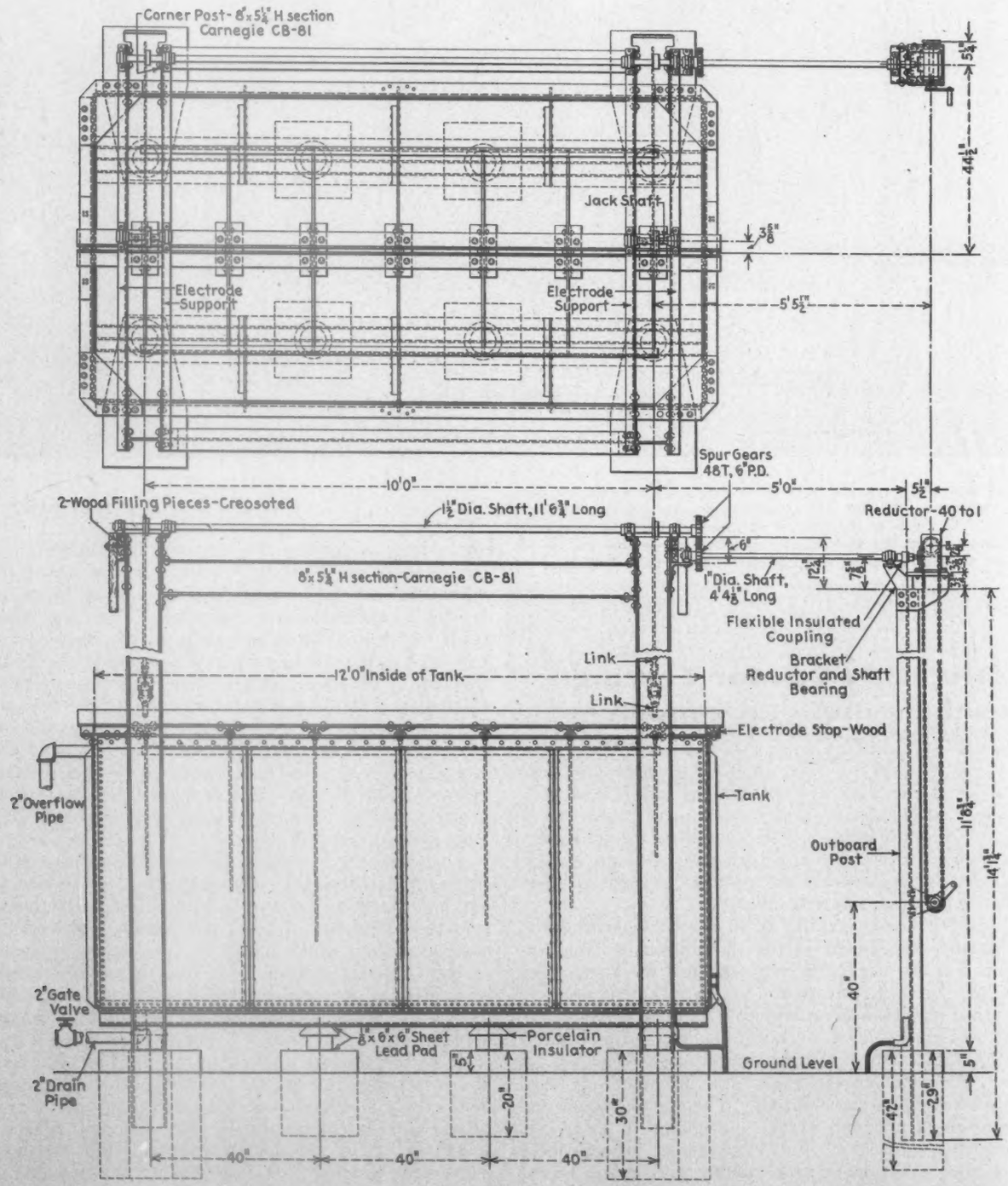
ber just above the hoisting crank. The circuit breaker is rated at 2,000 amp., 750 volts, d.c.

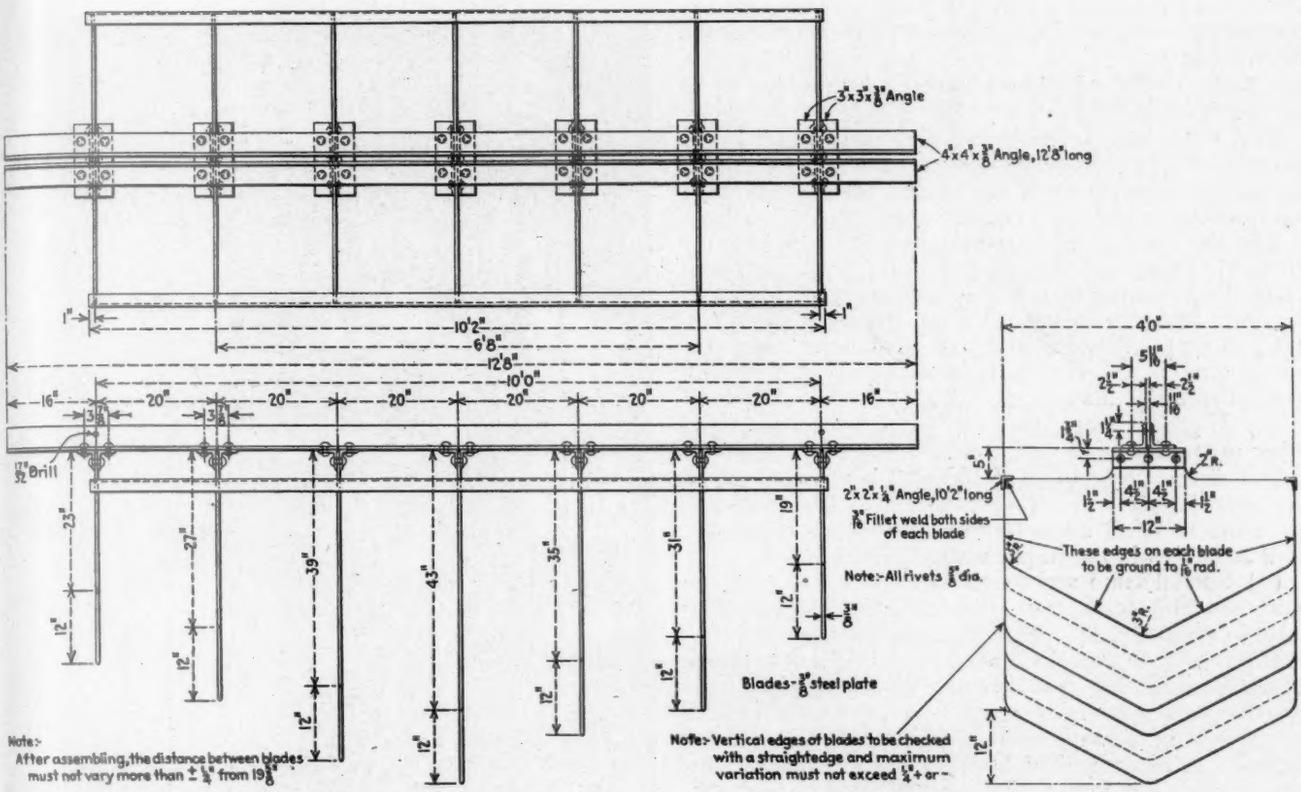
Instead of the highly corrosive sodium chloride usually used for liquid rheostates, the electrolyte in the tank is a solution of sodium carbonate of sufficient concentration to allow for applying full load to the engine when the greater part of the plates are immersed. A higher concentration would permit loading with only a small plate area immersed; but this would lead to boiling at the plate surfaces and cause an unstable load condition.

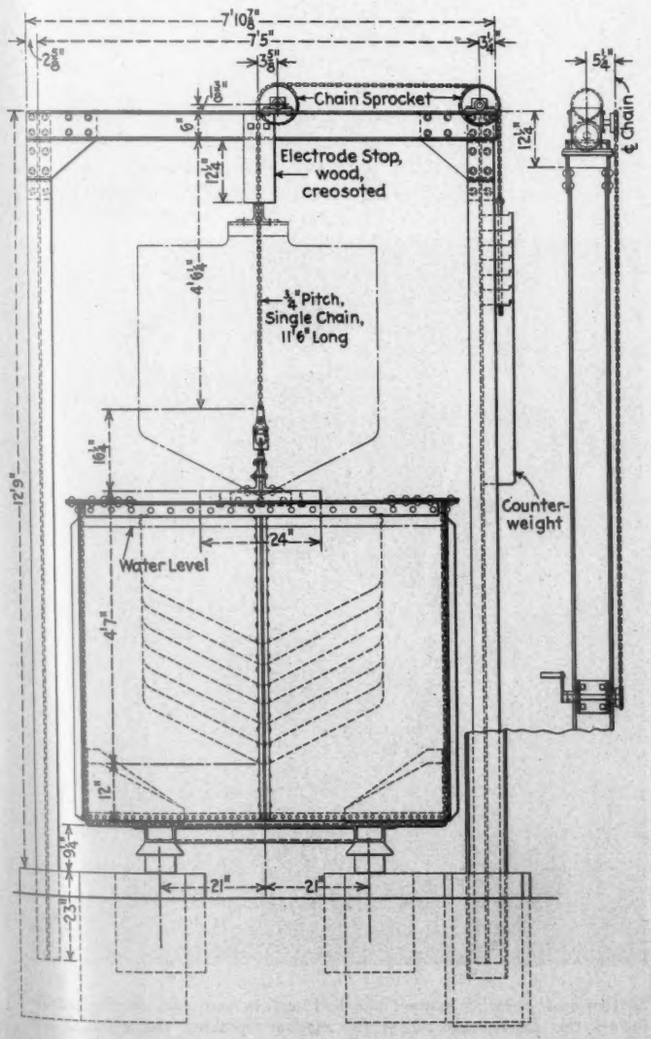
The rheostat can carry a load of 1,400 amp. at 714 volts. This load value was obtained with one of the railroad's motor generator locomotives, the rheostat providing the means for setting the exciter field on these straight-electric locomotives. Due to the all-metal construction of the tank and the resultant radiation properties, loads considerably in excess of this can probably be handled.

For the testing of Diesel-electric locomotives the rheostat has sufficient capacity for carrying full load output on a 1,000-hp. engine continuously. For the making of final load tests, the engine and generator are brought up to normal operating temperature which permits the making of all necessary adjustments. During tests, settings are made on relays and load control devices. The portable electric meters register load output while a maximum pressure indicator and exhaust-gas pyrometer and thermocouples are used to check Diesel-engine cylinder conditions. The rheostat is now used for switchers and will be used for road locomotives.

Plan and side elevation of the water rheostat




3"x3"x⅜" Angle
4"x4"x⅜" Angle, 12'8" long
10'2"
6'8"
12'8"
10'0"
2"x2"x¼" Angle, 10'2" long
⅜" Fillet weld both sides of each blade
Note:- All rivets ⅞" dia.
Blades - ⅜" steel plate
4'0"
These edges on each blade to be ground to ⅛" rad.
Note:- After assembling, the distance between blades must not vary more than ± ¼" from 19⅞"
Note:- Vertical edges of blades to be checked with a straightedge and maximum variation must not exceed ¼"+ or -



TOP: Plan and elevation of the plate assembly forming the movable electrode. LEFT: End view of the water rheostat showing the electrode plate assembly fully immersed and the large central plate in fully raised position

100-Watt Fluorescent Lamps For Passenger Car Lighting

A highly efficient application of fluorescent lamps in the form of four 100-watt, T17 lamps, operating with one ballast on a 277/480Y-volt circuit has recently been advertised extensively. Its principal advantage at the present time is the saving of critical war materials and power for war plant lighting. It has been suggested by L. Schepmoes, The Safety Car Heating and Lighting Company, New Haven, Conn., that there will be serious thought given to the use of similar lamps and ballasts in railway passenger cars after present wartime restrictions on fluorescent lighting are lifted. He suggests comparing the use of 100-watt and 40-watt lamps, by way of considering what advantages may accrue, other than the novelty of using something different for more decorative appeal. Such lighting efficiencies and savings in installation and maintenance costs as can be expected are indicated in the following:

On a basis of comparable lamp loads delivered by generator, let us take as our basis:

Four 100-watt lamps with ballast = 436 watts
Eight 40-watt lamps with Tulamp ballasts = 448 watts

With 42 lumens per watt for 100-watt lamps and 52 lumens per watt for 40-watt lamps, we have for efficiencies:

16,800 lumens ÷ 436 = 38.53 l/w for 100-watt output
16,640 lumens ÷ 448 = 37.14 l/w for 40-watt output

With present list prices of lamps and ballasts used for

comparing costs, we have initial investment per initial lumen output:

$20.60 ÷ 16,800 = $.0012 per lumen for 100-watt layout
28.80 ÷ 16,640 = $.0017 per lumen for 40-watt layout

The foregoing figures show slight advantage in efficiency of 100-watt lamps with considerable saving in initial cost of lamps and ballasts to deliver equivalent light output in favor of 100-watt lamps.

The 100-watt lamps are rated for 3,000 hours and the 40-watt lamps for 2,500 hours. List price costs and rated life of lamps give a rough estimate of $3.75 per car year saving in maintenance for 100-watt lamps.

Opposed to efficiency and cost advantages some disadvantages are indicated in using 100-watt lamps on 280-volt circuits in railway cars:

(a) Higher voltage requires heavier insulation and other precautions.

(b) Surface brightness of 100-watt lamps is about 13 per cent higher than 40-watt lamps. This additional glare can be absorbed by proper translucent shades but with some loss in lumen per watt efficiency.

(c) Special lamp sockets and special starters are required for 100-watt lamps, although the added cost of each is offset by the reduced quantities required.

There may be some tendency to claim the advantage of much higher foot-candle illumination obtainable from 100-watt lamps on the assumption that fluorescent lamps end to end in a continuous ceiling trough produce 840 lumens per foot with 100-watt lamps, compared to 520 lumens per foot with 40-watt lamps. Such increased foot-candle illumination necessitates an increase in lamp load wattage. It is also questionable whether more than 20 foot-candles, illumination from continuous 40-watt installation is desired in a railway passenger car.

Magnetic Base For Portable Drill

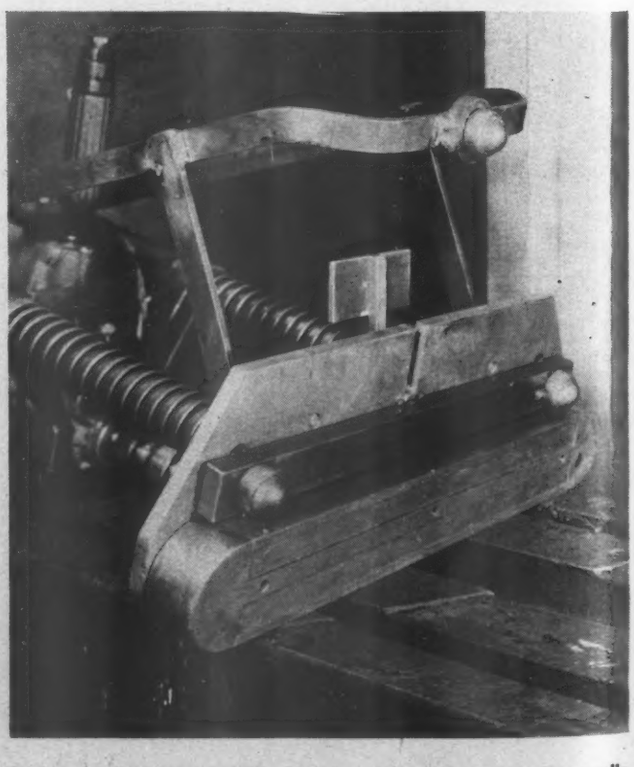
A portable drill with an electro-magnetic base improvised to speed the job of drilling and tapping holes in large water-wheel generator frames and similar equipment in manufacture at General Electric's Schenectady, N. Y., works can also be used for counter-boring and countersinking. Holes in the generator frame, a 1¼-in. casting, are drilled and tapped at an angle, using the holes already drilled in 3/16-in. cover plates for templates. One man can set up and perform the operation easily.

The tool is simple to make. It consists of a railbonding drill frame altered to make it a reversible multivane drill. A third leg added to the frame provides stability. The drill is fitted with a taper socket and a quick-change chuck to speed the changeover from drill to tap, since once the drill is positioned the hole is drilled and tapped without disturbing the setup. The drill is ratchet fed.

The electro-magnet used will exert a force of about 500 lb. on material with a minimum thickness of 3/16 in., and equal force on material of greater thicknesses. An air gap of 10 mils between the poles of the face plate and the cover plate compensates for irregularities on the cover plate surface. The magnet operates on 120 volts and is energized and de-energized by means of a toggle switch conveniently located on the frame. A foot-treadle is used to lower the magnet to the work and to raise it for repositioning the drill. When the magnet is in the raised position, the three-legged frame can be moved about easily on its ball casters.

A solenoid-operated air valve between the air source and the drill keeps it inoperative unless the magnet is energized. Thus, if power on the drill is lost, the chance of possible damage to the tool or operator is eliminated. The valve is wired in parallel with the switch and on the magnet, or load side, and is normally closed.

Air drill and magnetic base in operation—The toggle switch is shown at the front and the releasing treadle is on the side of the magnet opposite the drill



Bottom view showing magnet and ball casters—pressure on the treadle lowers the casters and raises the magnet breaking the residual pull

Electrician Solves Transportation Problem

The rubber and gasoline shortage have not kept A. H. Matthews, electrician, from reaching the Canadian National's Quebec shops regularly and on time, although he lives twelve miles away, at Lake Beauport. He has solved his commutation problem with "Electra", the snow-mobile shown in the illustration.

The body is 5 ft. long and 24 in. wide at the center, has a spruce frame and is covered with 2-ply-wood. It

The snow-mobile, "Electra", which has fulfilled A. H. Matthews' commutation requirements. A windshield has since been added

rides on three skis or runners (3 point suspension), two at the rear and one at the front which may be turned by means of a steering wheel inside the body. The two rear runners are each 6 in. wide and 48 in. long. The steering runner is 6 in. wide and 36 in. long.

Motive power is derived from an electric motor directly connected to a 36-in. laminated straight grain white birch propeller, one blade of which may be seen in the illustration. Power for the motor is derived from a 12-volt battery. The motor, suspended in a cradle back of the driver, is a series wound machine which was found on a junk pile and purchased for $5.

When asked for information, the designer replied that the motor is 8 in. in diameter, 16 in. long; that its original voltage is doubtful and that it draws 90 amp. on a 12-volt battery, while driving the propeller at 3,000 r.p.m. or more. The 1 in. shaft between the motor and the propeller runs on ball bearings.

Electra's speed on ice, with steel runners, is given as 32 to 75 m.p.h., on hard packed snow as 25 to 45 m.p.h., and on soft drifted snow as 10 to 25 m.p.h.

The motor is driven by two 6-volt, 120 amp.-hr. Willard storage batteries, connected in series. Two other similar batteries are carried in case of need. The distance which can be travelled depends upon road conditions and the velocity and direction of the wind. With a following wind there is plenty of power left in a 12-volt, 120 amp.-hr. battery after the 12 mile run. With heavy snow, it is a case of "get out and push" uphill. Also when the snow is heavy, the second battery is substituted for the first one, at the 6-mile point. This is accomplished by transferring a pair of spring clips from the terminals of one battery to the other. The motor is started and stopped by a single-pole, single-throw switch. Braking is effected by a hand lever which lowers an iron hoe blade to the ground, at a point between the rear runners. The batteries are charged at both ends of the run. Electra's weight complete is 140 lb.

The propeller and the three runners, purchased from the Lorenzen Propeller Co., Niles, Mich., represent a total cost of $31.19. The four batteries were $40, and the motor $5. The total cost was thus $76.19, plus a small amount for spruce framing and ply-wood.

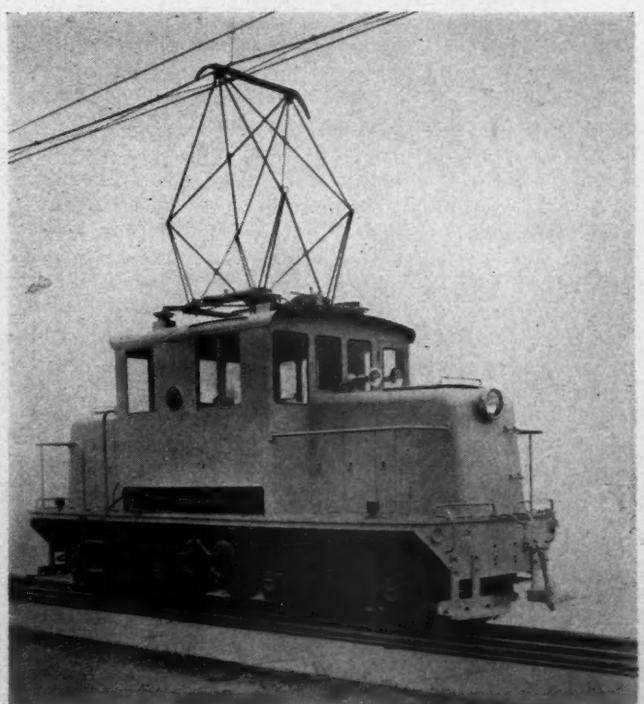
It is the designer's intention to put wheels on Electra for summer operation.

Chile Receives Electric Locomotives

Nine locomotives such as shown in the illustration, together with two complete spare trucks, were shipped recently from one of the General Electric Company's eastern plants to Port of Export for use in the mines of Cla. Salitrera de Tarapaca y Antofagasta, Iquique, Chile. These 40-ton locomotives were built to operate on meter-gage track from a 500-volt, d.c. overhead trolley.

Each locomotive is equipped with four 75-hp. motors with forced ventilation and single-station, full-magnetic control with dynamic braking. Power is collected by pantograph on the main haulage line and by means of an electric-motor-driven cable reel equipment having 4,200 ft. of single conductor cable.

The successful operation of other Chilean Nitrate's properties led to the modernization of methods at this mine, together with the adoption of electric haulage. With this shipment, the number of G.E. locomotives of approximately this weight shipped to the Chilean Nitrate fields will be 70.



The reel and cable under the cab are used to permit operation beyond the limits of the overhead wire, particularly on ladder loading tracks

CONSULTING DEPARTMENT

Water in Conduit Systems

Some time ago we installed a conduit system in an enginehouse which we tried to make as tight (moisture-proof and vapor-proof) as possible. As soon as cold weather came on, all the low places filled with water and we had to drill holes to let the water out. What is the best way to take care of a situation like this?

Precautions Prevent Trouble

Moisture-proof and vapor-proof conduit systems must be carefully designed and installed in order to obtain satisfactory, trouble-free installations. It must be remembered that the conduits, boxes and fixtures, etc., enclose a volume of air of the same relative humidity as the surrounding atmosphere. This air is trapped when the system is sealed and thereafter cannot gain or lose moisture if the job is installed perfectly tight. The temperature of this trapped air, however, will vary with the surrounding ambient. When the temperature falls below the dew point of the trapped air, it will drop its moisture in the form of condensation on the inner walls of the conduit system. The resulting water will collect, if of sufficient quantity, at all low points in the system. When temperature falls below 32 deg. F. this trapped water will freeze, causing damage to both conduit and cables.

This condition should and can be avoided by carefully designing the conduit system with a liberal slope (6 in. per 100 ft.) so that all condensation will drain out of the conduit to a box. No box should be located where it may become filled with water. As soon as water collects in a box to the height of an outgoing conduit which runs to a lower box, the surplus will flow to that box. The layout should be so co-ordinated that all moisture will be collected at a few low points. It is advisable to install an additional drain box below each outlet box at these locations. In this manner, wires and devices in the lowest outlet box will never be submerged. The drain box can be provided with a plug which is removed whenever sufficient water has collected. It may even be desirable to keep the cover off this box during certain periods when condensation is most prevalent.

Although the simplest and cheapest way of removing condensation is to drill holes in the conduit at the low spots, the method is quite crude and may result in damage to the cables which may be cut by the burr on the interior wall resulting from the drilling. All corrosion resisting material has been removed by drilling and much more rapid deterioration will result at this point, particularly in view of the fact that all condensate will flow through at the very spot with the least protection. A somewhat better way of doing the same thing is to use a plumber's tee fitting as a coupling at the low point. The leg of the fitting is set facing downward and acts as the drain.

Where water will collect in outlet boxes, the simplest way to drain the condensate is also to drill a hole in the cover at the low point of the box. This defeats the primary purpose of the tight conduit system as it permits breathing of the air within the system. This means that the injurious fumes or vapors which the layout is designed to exclude will be drawn into it every time there is a change in temperature, defeating its very purpose.

Probably the best arrangement for draining a raceway system is to run conduit from the lowest boxes to points outside the area in which the moisture-proof conduit system is required. Leave the end of this small conduit open at all times. A box may be installed at this location if desired to improve the appearance if this is a point which must be considered. The cover should be provided with a weep-hole.

Special precautions should be taken where conduits enter panel-boxes. It is preferable that they enter from the sides when they come from outlet boxes located at levels above the panel box. By following this arrangement, all condensate draining in from these conduits will flow down the sides of the panel box and will not drip from the top upon switches, cutouts or other devices mounted therein. If a drain conduit is not installed, at least one conduit should be run from the bottom of the panel box to carry off any accumulation of water. Drainage should then be provided at the lowest box in the system as mentioned above.

All wires entering the panel box from top or sides should be provided with drip loops where all condensate will be shed before coming into contact with splices or exposed conducting parts. This will prevent creepage and corrosion which in time will undoubtedly cause trouble.

Where vapor-proof lighting fixtures are installed in such a system, care should be exercised to ascertain that water will not collect on current carrying parts of the socket or fill the glass enclosing globe. Pendant type fixtures should be installed where possible, the upper end of the stem being sealed to prevent water entering from the outlet box and finding its way down into the globe.

STANLEY A. KROLL,
Electrical engineer.

Can you answer the following question? Suitable answers will be considered as contributions and will be published in a subsequent issue. If you have questions to ask, send them in also. Answers and questions should be addressed: Electrical Editor, *Railway Mechanical Engineer*, 30 Church Street, New York, N. Y.

Can you suggest ways and means of improving the performance and increasing the life of endless V-belt drives such as are used for railway-passenger-car, air-conditioning compressors?

Various Wiring Systems May Be Used

Since the inception of the conduit system of electrical wiring, problems of condensation have appeared, especially in southern sections. The amount of condensation varies with the moisture content and temperature of the air. Warm air can keep more moisture in suspension than cold air and, when chilled, this moisture is precipitated and dew is deposited in the conduit. Moisture is known to be one of the worst enemies of insula-

tion and the conductivity of water increases as it is contaminated with dirt and chemicals, such as present in an enginehouse.

Vapor-Proof System.—The accumulation of water in conduits may be reduced to a satisfactory extent by the use of well-sealed moisture-proof and water-proof electrical fittings. This is, however, an expensive way of remedying the objectionable condition. In the present case, it would seem that the system is "breathing" at some point or points. A close inspection of all mechanical connections should be made to stop air circulation through the conduit. All conduits should be run, wherever possible, in dry places and where the temperature variation is a minimum.

Inverted Wiring.—In sections where there is possibility of severe condensation, the conduit system should preferably be distributed in such a way as to prevent the formation of water pockets. Where properly designed conduit tunnels or floor channels are not available for under floor access to the conduit system, branch circuits can be distributed from an overhead distribution panel with conduits running down into junction or outlet boxes and allowing evaporation or seeping out of the collected moisture deposits.

Drained System.—Where conduit tunnel or under floor space is available, conduits may be run in that space provided junction boxes are placed at all points where collection of water may be expected. These junction boxes should be installed without cover gaskets and made generally non-watertight to permit seepage.

Where neither of the two foregoing methods are applicable and a conduit has to be run U-shaped creating a water pocket, one or two "weep" holes are drilled at the lowest point of the conduit run. The second hole is provided as a measure of safety against clogging of the other. Where excessive moisture troubles exist, lead covered wire or the new low absorption wire may be used in addition to the foregoing measures. In applications where exposure to the sun or periodic high temperatures cannot be avoided, the new high-heat rubber covered wire should be used.

Sealed System.—In an existing conduit installation where stamped steel fittings have been used and the foregoing methods of draining cannot be applied the conduit run collecting water is blown out thoroughly, dried and then sealed at both ends. A satisfactory method of sealing consists in loosely caulking the conduit ends with wires protruding and then sealing with heavy pothead compound heated to the proper pouring temperature.

R. G. CAZANJIAN
Supervisor,
Triborough Bridge Authority,
New York

Why Use Conduit?

There is no practical method of keeping moisture out of conduit. The alternate heating and cooling of the cables due to fluctuating load will draw in moist air which condenses and collects in the low spots.

A method which has been used satisfactorily by at least one railroad is to install without conduit a cable with a synthetic jacket to give mechanical protection as well as corrosion resistance. A copper shielding tape may be applied under the jacket to give ground protection. This not only eliminates trouble from moisture condensation, but also eliminates the problem of conduit corrosion which is so serious where coal smoke and moisture are present in combination. An earlier installation where open wiring has been used was described in Railway Electrical Engineer, April, 1937. In this instance, braided cable was used, but a synthetic jacket, such as Flamenol, will give better corrosion resistance.

A second method would be to install the conduit run at a slant so that there is only one low spot. All moisture runs to that spot where it may be drained.

On a conduit line already installed, drilling holes in the low spots is about the best solution. These holes would probably soon become clogged, however, and this would necessitate periodic checking. If a tee were inserted in the conduit at each low spot, and a trap attached to the tee, an effective drain would be provided which at the same time would provide a seal.

L. D. MADSEN
Central Station Engineering Dept.
General Electric Company
Cable and Wire Section

The Best Conduit System Will "Breathe"

The best way to keep moisture from collecting in a conduit system is to provide a means of draining the system. Perhaps the easiest way to do this is to drill a small hole at each of the low points of the system. Conduit fittings and conduit threads are not intended to be water tight. Therefore it is next to impossible to make them water tight in the first place, and it is a hopeless job to maintain them in a water tight condition. The best that can be done is to make sure that water is not introduced into the system by being allowed to drip into an open condulet, or by following a wire down through a weatherhead. If possible a conduit system should always be installed like the letter *A*, and not like the letter *U*. The former will drain while the latter will not, unless a drain hole is provided at the bottom of the loop.

All conduit systems are filled with air, and all air contains a certain amount of moisture. The question stated that the low point of the conduit system filled with water when cold weather came. Let us see what happened. The conduit may have been installed on a warm summer day, when the humidity was high—that is when the air contained a large amount of water vapor. This moist air was sealed into the conduit system. Then when winter came and the temperature dropped, and the moisture inside of the conduit system condensed, with the result that water was formed within the conduit even though no water had been introduced from without. In most conduit systems, however, water gets into the conduit by the process known as "breathing." We all know that air expands when it becomes heated, and that it contracts when it becomes cold. Thus, if the air inside a run of conduit becomes hot, a pressure is generated with the result that some air is forced out. When the temperature drops and the air contracts, some outside air is sucked into the conduit. Each time this happens a little moisture is introduced.

Designers realize that conduit systems can not be made air tight. Explosion-proof conduit fittings are not made air or gas tight even when they are intended to be used in an atmosphere which will contain explosive gases. It is realized that gas and air will "breathe" into and out of the system regardless of what is done. Explosion-proof fittings, therefore, are made strong enough so that any dangerous gas which does get into the fitting can explode within the fitting or conduit without causing explosive gases outside of the fitting to explode.

A. R. BASSET.

NEW DEVICES

Materials Saved By Car-Brass Trimmer

Extensive experience seems to prove that copper, tin, lead, zinc and antimony, or all critical materials used in journal bearings, can be saved in substantial quantities by American railroads through more extensive use of the car-brass trimming machine which was developed by the Journal Box Servicing Corporation, Indianapolis, Ind., in 1937 and has since been improved and thoroughly tested on a number of railroads in different parts of the country. An article referring briefly to the performance of this machine was published in the January, 1940, issue of *Railway Mechanical Engineer*.

The car-brass trimmer is a portable

Portable car-brass trimming machine with the hood lifted and shaper raised, ready for operation

hand-operated shaper designed to trim the edges of journal linings and reshape the original oil grooves on bearings that might be replaced, as well as those in a partially over-run condition. The machine consists of a small double-head, hand-operated shaper which has a special chuck for holding the brass, and cutter heads and tools with cross and vertical hand feed. The shaper is mounted on a steel frame which is carried on two 26-in. rubber-tire wheels with handles on the front for convenience of moving the machine about the shop. A hand-operated worm gear and quadrant permit lowering and retracting the heavy part of the machine and a hinged metal cover protects it from the weather when not in use. A sheet metal box at the rear provides carrying capacity for spare brasses. In general this machine is designed for movement to any point on the repair track where a truck is being repaired or a journal repacked. The work of trimming the lining edges and reshaping the oil grooves is done in from one to two minutes when the bearing is removed for inspection and it is then returned to the same journal on which it was run-in and has a full seat.

The possible saving of critical materials as well as improvement in journal lubricating conditions is evident from a brief review of railroad practice which permits turning down surface-marred and cut journals until ½ in. less than the original diameter before scrapping. New journal bearings, made with a fixed radius slightly greater than the radius of the full size journal, are applied to journals that have been reduced in radius by turning, thus producing a bearing fit of very limited area. To compensate for this great tolerance a lining metal of soft lead-base is applied to bearings to enable them to correct as quickly as possible the imperfect fit by the soft lining adjusting itself to the contour of the journal.

Unquestionably the break-in period is often responsible for hot boxes because when a new bearing is applied to an undersize journal the load is estimated often to be as great as 2,000 lb. per sq. in. of bearing area, while a fully seated bearing carries only about 400 lb. per sq. in. maximum. In the process of conforming the babbitt lining to the contour of the journal it has been found that the babbitt flows at the bearing edges, thus restricting proper circulation of the oil; also, the oil groove on each side of the bearing is frequently closed at the center, due to shocks received in service. As a result such bearings operate at temperatures so high as to cause failures in service.

A. A. R. Interchange Rule 66, Par. j. calls for the renewal of journal bearings, "when lining is spread over side ⅜ in. or more below bottom edge of side wall of brass, either side, regardless of length of such spread." This rule is generally interpreted to mean, when the lining is spread ⅜ in. below a straight line across the bottom of the shell of the bearing, whereas what was probably meant by "bottom edge of side wall" was the bottom edge of the lining at the top of the oil groove. The reason for this assumption is that the spreading of the babbitt sufficiently to fill the oil groove, or reduce its width, is almost as damaging as if it extended ⅜ in. further. If the babbitt extends below the straight line, lint wipers will build up under the edge of the over-run babbitt.

The theory underlying advantages secured by eliminating over-run bearing edges and especially restoring the oil grooves is well illustrated in the drawings which show (at the left) the edge of a bearing in contact with a journal on the rising side. The bearing is fully seated and has been trimmed with the brass trimmer. It will be noted that as the journal carries the adhering oil containing particles of fine lint to the bearing; the excess is wiped off and clings to the outer edge of the oil groove, swings to under-side of the bearing, and forms in drops along the full length of the bearing where it drips back into the packing, free of the rising journal.

This drawing also shows (at the right) a fully seated bearing with the babbitt lining spread at the edge. The extended babbitt, and lack of oil groove, prevents the excess oil from swinging out onto the bearing away from the journal. Gravity causes it to run back down the rising journal which carries it back to the bearing. The hot oil pools up along the edge of bearing and journal and, as more oil is brought up, it overflows at the back end of the bearing, and is carried on to the larger diameter axle by centrifugal force and thrown onto the wheel. The lint in the oil, lacking the flow to carry it on, drifts under the overhanging babbitt, causing a "wiper."

The principle of maintaining a fully

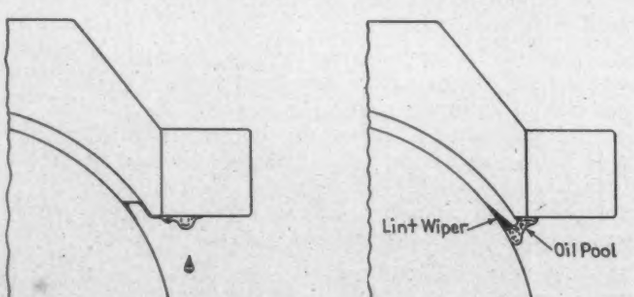


Fig. 1 Fig. 2

Left: Properly trimmed car-journal brass, cooled by oil which carries fine lint back to the packing without contacting the journal—Right: Over-run brass with oil and lint building up along the edge of the bearing—This is a potential cause of a hot box and of the loss of oil out of the back of the box

run-in bearing on its original journal is borne out by the practice of an automobile mechanic adjusting the connecting rod bearings of an automobile. As each cap is removed he is careful to mark it to be sure that each cap is returned to the same bearing. The caps are all alike and can be interchanged, but the mechanic knows that to mix them up is to invite disaster. Therefore, he returns each cap to its original station. Car journal bearings, trimmed and returned to the same journal, will not again

Method of operating the car-brass trimmer to remove over-run babbit and cut new oil grooves

run over, and should continue to operate until worn out, with only a yearly touching up required to remove the effect of slight upsetting due to blows caused by bearing lifting from journal in heavy switching, etc. Trimmed bearings are said not to accumulate lint wipers, as is the case with over-run linings.

Trimmed bearings also should not develop cracked or loose linings, which are caused by excessive temperatures due to over-run linings and lint wipers. This supports observation over a number of years, which has proved that cracked linings are caused by excessive heat, usually as a result of lint wipers along the edge of the over-run babbitt. The wipers cause a bright streak across the face of the lining due to stopping the flow of oil at that point. The increase in temperature at that part of the lining may reach a point as high as the melting point of solder (380 deg. F.) with which the lining is bonded to the bearing. This may cause the lining to loosen from the back at the point where melting occurs. Subsequently the motion of the metal in the loose spot causes the cracking. The melting point of the babbitt lining is approximately 500 deg. F., hence it does not melt.

Exhaustive service tests of bearings reconditioned by the use of the car-brass trimmer show that not only are journal bearings saved but improved lubricating conditions result. The record of a single machine on one railroad in the Middle West was kept for a period of one year in which 5,557 cars were repacked and 44,456 journals inspected. The following results were recorded: (a) Number of brasses found O.K., 11,556; (b) Number of brasses trimmed and saved that would have been scrapped if the brass trimmer had not been available, 8,504; (c) Number of brasses partly over-run, which were trimmed to improve their appearance, 23,420; (d) Number of new brasses actually applied, 976. The sum of (b) and (d) represents the number of brasses that would have been scrapped except for the brass trimmer, or 9,480 brasses which represents normal replacement. Of this number 8,504 brasses were saved or 86.4 per cent of normal replacement.

Similar records for the use of a number of car-brass trimmers on a Southern carrier are as follows: Cars packed, 33,252; brasses trimmed to save, 85,454, or 2.57 per car; brasses trimmed to improve, 110,256, or 3.31 per car; brasses found O.K., 48,238, 1.46 per car; brasses replaced with new, 22,068, or .66 per car; total brasses inspected, 266,016.

The procedure of trimming a perfectly sound brass already seated to the contour of the journal, but with the lining spread over the side wall of the bearing, is simple. The actual time required, from the moment the bearing is removed, trimmed and reapplied to the same journal, is said to average between one and two minutes. The cost, in which rental and labor is computed, will average between two and three cents a brass.

The total amount of iron and steel involved in the manufacture of a brass trimmer is approximately 250 lb. Reports indicate that each machine has saved the replacement of 120,000 lb. of new or relined bearings annually and this, in turn means that it would have been necessary to add at least 3,000 lb. of new critical material stocks, of copper, zinc, lead, tin and antimony.

Magnetic Inspection Equipment

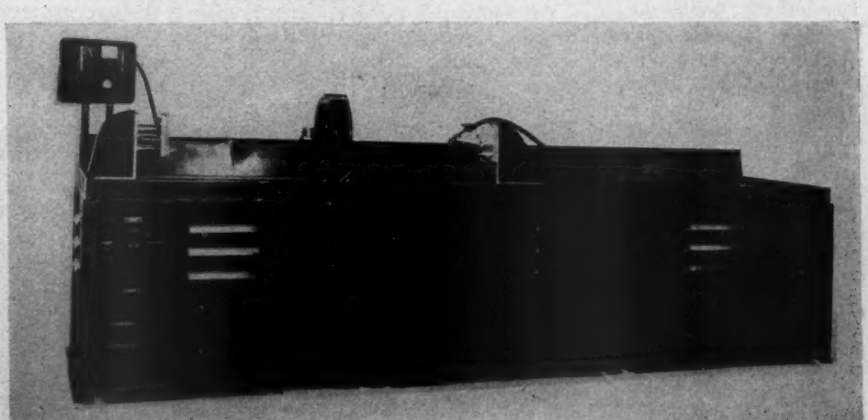
Magnetic inspection units bearing the trade name "Ferroscope" are being offered for use in railroad service by the Western Industrial Equipment Co., Los Angeles, Calif. The unit shown is made in six sizes, to test parts ranging from 4 ft. to 10 ft. 6 in. in length. The cabinet houses the batteries, charger, magnetic switch with time-relay control, and a circulating pump. The tailstock at the right is also motor operated. The current required is 110-volts, 50-60 cycles.

The part to be tested is clamped between the tailstock contact plate and the spring-loaded headstock. It is then sprayed with a solution of ferrous oxide and the current, which may be controlled over a range of 0 to 500 amp., is run through the part for about ½ second. A concentration of the oxide will cling to the outlines of any surface cracks and also will adhere to points above hidden defects, such as blow holes, non-metallic inclusions, faulty welds, etc. Excess solution drains into a sump, from which it is returned to the pump. The demagnetizing coil shown between the head and tailstocks operates on alternating current and may be made with an opening at one side to avoid the need of sliding it over the test pieces.

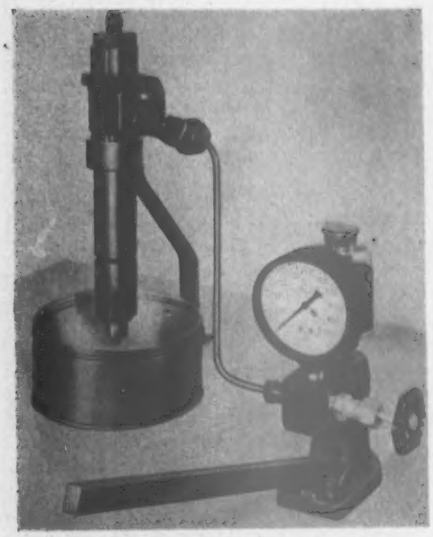
Diesel-Engine Fuel-Nozzle Tester

The satisfactory operation of railroad Diesel engines, like those used in other industries, is dependent upon some means for the easy testing and adjustmnt of fuel injection nozzles, since defective nozzles not only impair engine performance but tend to cause the formation of carbon on the valves, cracked pistons, etc. To facilitate maintaining Diesel engines at peak operating efficiency, the Aircraft & Diesel Equipment Corporation, Chicago, has developed a portable nozzle tester, Model PH-24, especially designed for testing Diesel nozzles and other devices subject to high liquid pressures. The tester is precision built, weighs only 8½ lb. and is hand-operated by an easily removable handle. It is designed to produce pressures up to 10,000 lb. per sq. in.

Features of the original Model PH-22 Adeco tester include a suction valve construction which is said to be free from air troubles; a shut-off needle valve which prolongs the useful life and accuracy of the



Flaws are detected by magnetizing the piece to be inspected and then applying a solution of ferrous oxide



Diesel fuel-nozzle testing device

hydraulic pressure gage by disengaging the gage when the device is used for leakage tests and readings are not required; and a heavy-duty hydraulic pressure gage. Features of the PH-24 tester include push-button priming which facilitates starting with a dry unit and the provision of valves of unusually durable construction which will stand up under heavy clamping without distortion.

The Adeco tester is designed for checking all sizes and types of fuel injector nozzles by means of standard adaptors which may be supplied as required. It may be used as a portable unit for checking injectors on the engine or with equal efficiency as a permanent test-bench installation. The portable feature is especially valuable since injectors which test OK at the bench sometimes fail to function properly after installation, due to sticking nozzle valves caused by the deformation of valve parts under heavy clamping. The use of this tester permits quickly discovering such defects directly at the Diesel engine.

Bullard 74-In. Vertical Turret Lathe

One of the developments of the Bullard Company, Bridgeport, Conn., brought about in part by war production work and which the railroad shop can take advantage of is the 74-in. Cut Master vertical turret lathe. The smaller sizes of this type of machine, from the 30-in. to the 64-in. capacity, were described in the *Railway Mechanical Engineer* for October, 1939, page 414, but production on these sizes was halted because of government restrictions.

The capacity of the 74-in. machine, with the side head in the working position, is 78 in.; with the side head below the table top the maximum capacity is 82 in. Within this capacity range, for example, fall about 80 per cent of all the wheel centers and tires used on American railroads. This model has six head combinations involving the use of the ram, side and turret heads. A swiveling turret or ram head, right or left hand, is standard equipment with the screw feed and has rapid power traverse in all directions. These may be supplied with the original machine or added at any time as a standard unit, with the feed works. The turret head is 18 in. in diameter with five faces having 2¼-in. tool post holes. With a vertical movement of 30⅜ in. it will face to full machine capacity and swivel 30 deg. right or left of center. Both right- and left-hand ram heads have 3⅜-in. tool post holes; a vertical movement of 30½ in. and will swivel 30 deg. right or left of the center. The horizontal movement of the right-hand ram head is 42⅞ in. with 7½ in. additional past center while the horizontal movement of the left-hand ram head is 46⅞ in. with 1½ in. additional past center. The side head is standard equipment as a right-hand head and has power traverse in all directions. It has a square turret of 5½ in. for 1¼-in. by 1½-in. tools; a 62-in. vertical movement and 27 in. horizontal. The distance from the top of the table to the underside of the slide is 52⅝ in. maximum and the maximum turning diameter is 78 in.

The table speeds vary from 3.29 r.p.m. to 120 r.p.m. in the high-speed range with a pulley speed of 1,244 r.p.m.; in the standard range, from 2.46 r.p.m. to 90 r.p.m. with 934 r.p.m. pulley speed and in the low-speed range the table speeds are from 1.65 r.p.m. to 60 r.p.m. with a pulley speed of 622 r.p.m. There is an optional speed range of 1.24 to 45 r.p.m. with a pulley speed of 466 r.p.m. All of the speed changes are effected by two ball shift levers to the right of the machine.

There are 16 feeds in geometric ratio, with independent feed works for each head. The vertical and horizontal feeds are so designed that they may be engaged simultaneously to give a 45-deg. resultant feed in any quadrant. The same is true of the rapid power traverse. The feeds range from .0026 in. to .500 in. and are the same for all heads.

The motor drive is by means of a V belt. A floor mounted motor is recommended although side bracket mounting can be supplied. The electrical controls are supplied as part of the machine equipment. The cutting lubricant system is also supplied with the machine. The T.D.A. unit—thread cutting, drum scoring, angle turning and scroll cutting—can be applied to turret, ram or side head.

The maximum projected floor space required, without cutting lubricant system, is 132 in. by 178½ in. and 170 in. high, the width depending on whether one or two heads are used on the rail. The approximate net weight of the base machine and cross rail is 52,000 lb. The turret head and feed works adds 3,700 lb.; the right- or left-hand ram head and feed works, 3,300 lb. and the side head and feed works 6,800 lb. The T.D.A. unit weighs 350 lb. These weights exclude the cutting lubricant system.

Dust Respirators

The American Optical Company, Southbridge, Mass., has developed an air-filtering cartridge for use with its type R-1000 respirator. This AD cartridge protects lungs against a combination of all kinds of dusts, including toxic, pneumoconiosis-producing, and nuisance dusts. Seven respirator cartridges have now been designed for inter-

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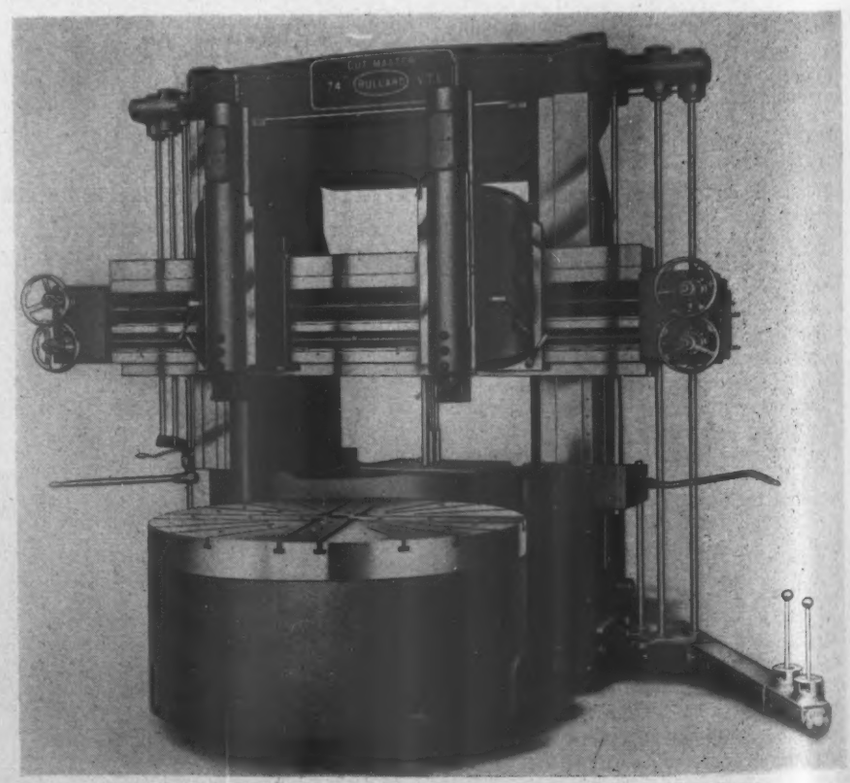
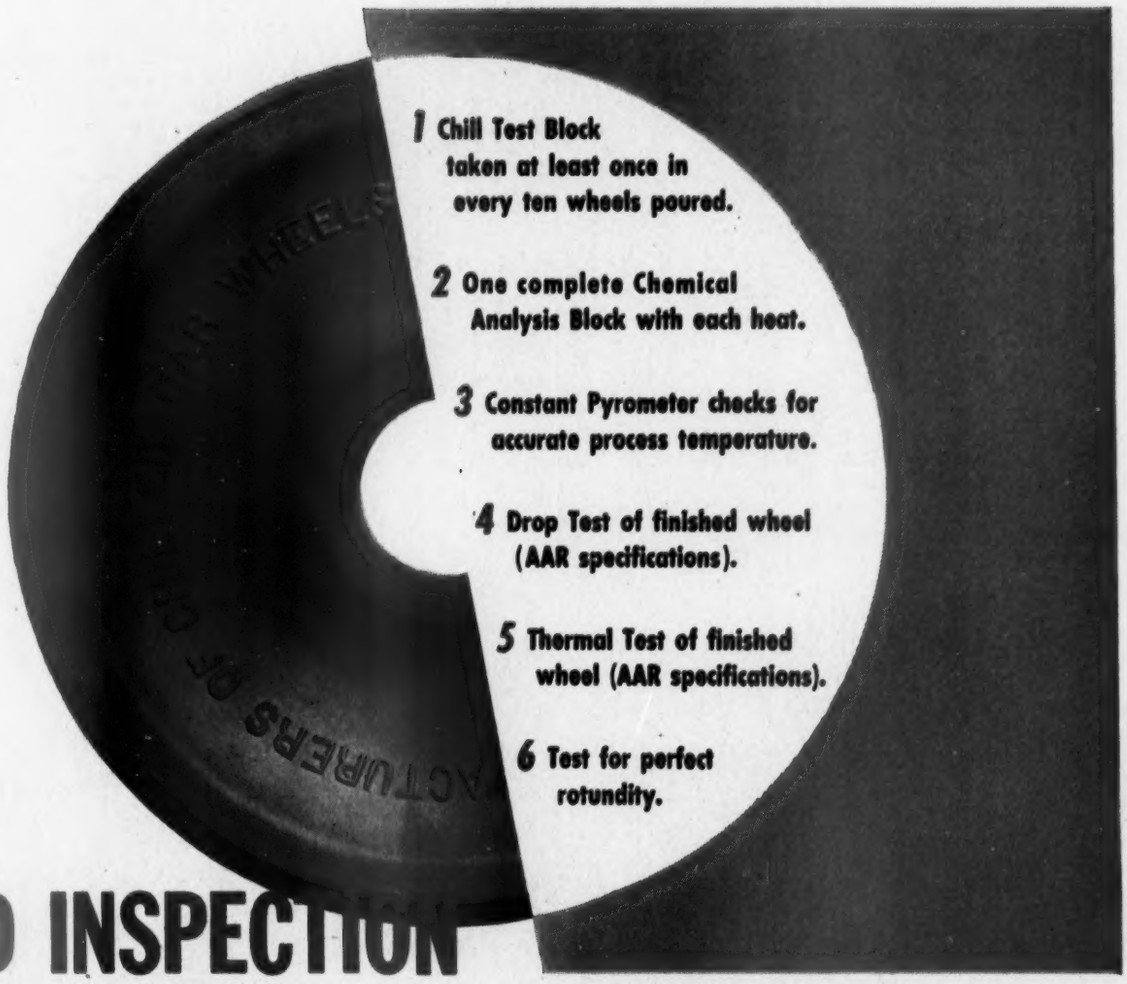
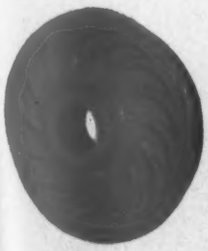


A Bullard 74-in. Cut Master—boring-mill type


1 Chill Test Block taken at least once in every ten wheels poured.
2 One complete Chemical Analysis Block with each heat.
3 Constant Pyrometer checks for accurate process temperature.
4 Drop Test of finished wheel (AAR specifications).
5 Thermal Test of finished wheel (AAR specifications).
6 Test for perfect rotundity.

RIGID INSPECTION

was Necessary to Establish the Phenomenal 1942 Railroad Record!



Rigid and regular inspection was necessary to handle the greatest volume of freight ever carried by the railroads.

Chilled Car Wheels aided in this inspection program because all chilled wheels are rigidly inspected and tested before delivery to the railroads.

Every Chilled Car Wheel is given the above six rigid tests in each of our 46 foundries, thus assuring absolute uniformity. Chilled Car Wheel inspection practices tie in with the rigid railroad inspection program and will again aid the railroads in their expanded 1943 inspection program.

3213

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

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ORGANIZED TO ACHIEVE:
Uniform Specifications
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Uniform Product

changeable use for protection against common respiratory hazards faced by industrial workers. All fit the standard R-1000 respirator.

Portable Sanding Machine

A portable vibrationless electric sander, compact in size and with a handle designed to fit the hand of either men or women operators, is being manufactured by the Sterling Tool Products Co., Chicago. It is equipped with a snap switch located on the handle within reach of the operator's thumb. A ⅛-hp. universal motor cooled by a turbine fan is protected from dust by a replaceable filter screen. The gears and counterpoise mechanism are sealed in a dust-proof cartridge-type gear case. Moving parts are supported by oversize ball and needle type bronze bearings.

A compact, portable sanding unit

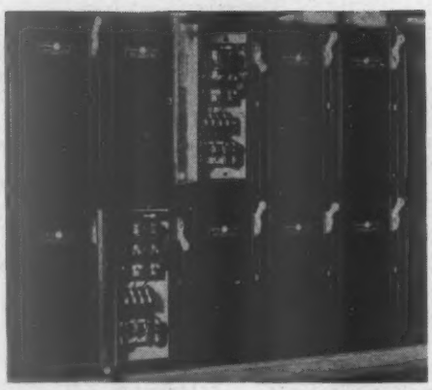
A detachable sanding pad operated by a simple latch-type lock takes one-third size sheets of standard abrasives and is sufficiently flexible to permit sanding on curved or flat surfaces. Tumbler action clamps, operated by a key or screw driver, lock the abrasive sheets on the sanding pad. The machine can be used for sanding surfaces on wood, composition or metal products. By using a felt or cloth matrix on the sanding pad the Sterling 1000 will also perform many lapping and polishing operations.

Magnetic Starters

A line of alternating-current combination magnetic starters for full-voltage starting of induction motors up to 7½ hp. has been announced by the General Electric Company, Schenectady, N. Y.

Available, as yet, only in NEMA sizes 0 and 1, the starters consist of a fusible motor-circuit switch and a magnetic starter incorporated in one compact unit to conserve space and installation time, to provide greater protection for equipment and operators, and to improve appearance. Also, to facilitate mounting groups of the starters close together, the operating handle is projected through the front rather than the side of the case.

The motor-circuit switch has silver-surfaced, snap-action contacts of the roller type which easily break stalled motor current. New Vystipe fuse clips hold the fuses securely in place by means of screw fasteners at each end, assuring good contact and preventing the fuses from being displaced if subjected to short-circuit conditions. Forms are also available with thermal circuit breakers in place of the fusible motor-circuit switch.



Having the operating handle in the front permits mounting the starters close together

Bimetallic overload relays are adjustable for either hand or automatic reset and protect the motor from overheating caused by repeated overloads, sustained overloads or too frequent starting.

Portable Car Spotter

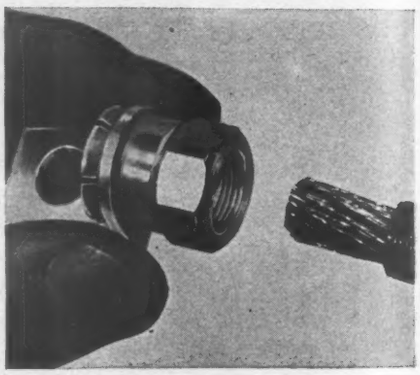
The line of motorized electric car spotters made by the Link-Belt Company, Chicago, heretofore furnished only for stationary mounting, is now available also in portable form, as shown in the accompanying illustration. The spotter is so balanced on a channel iron frame that one man can lift the one end and roll the unit to any desired location.

For operation, the frame is anchored with a chain, as shown, and the portable cord plugged into the nearest power outlet. One end of the haulage cable is hooked to car or object to be moved, and the other end wrapped around the capstan. By this means the standard machine has been given added versatility for spotting cars on any number of tracks. It is also useful for hauling trucks, and doing other moving jobs at separated locations.

The spotter may be used at any point where it can be anchored near an electrical outlet

Cable Lug

A light-weight cable lug for wire sizes 2, 0 and 00, suitable for railway, aircraft, marine and commercial installations, has been developed by Aircraft-Marine Products, Inc., Elizabeth, N. J. It features the collet type clamping ring which, when compressed by the tightening nut, applies uniform pressure from all directions insuring adequate electrical contact. The wire end is always visible, allowing easy inspection of the contact. Although mechanically strong, the contact will not injure the wire strands. When the tightening nut is released, the collet ring expands, permitting the wire to be removed.



The connector insures good conductivity and high mechanical strength

The lug is composed of only three simple parts and no special tools are required. Ordinary wrenches are used. It is made of copper for high electrical conductivity and is hot electro-tinned for corrosion resistance.

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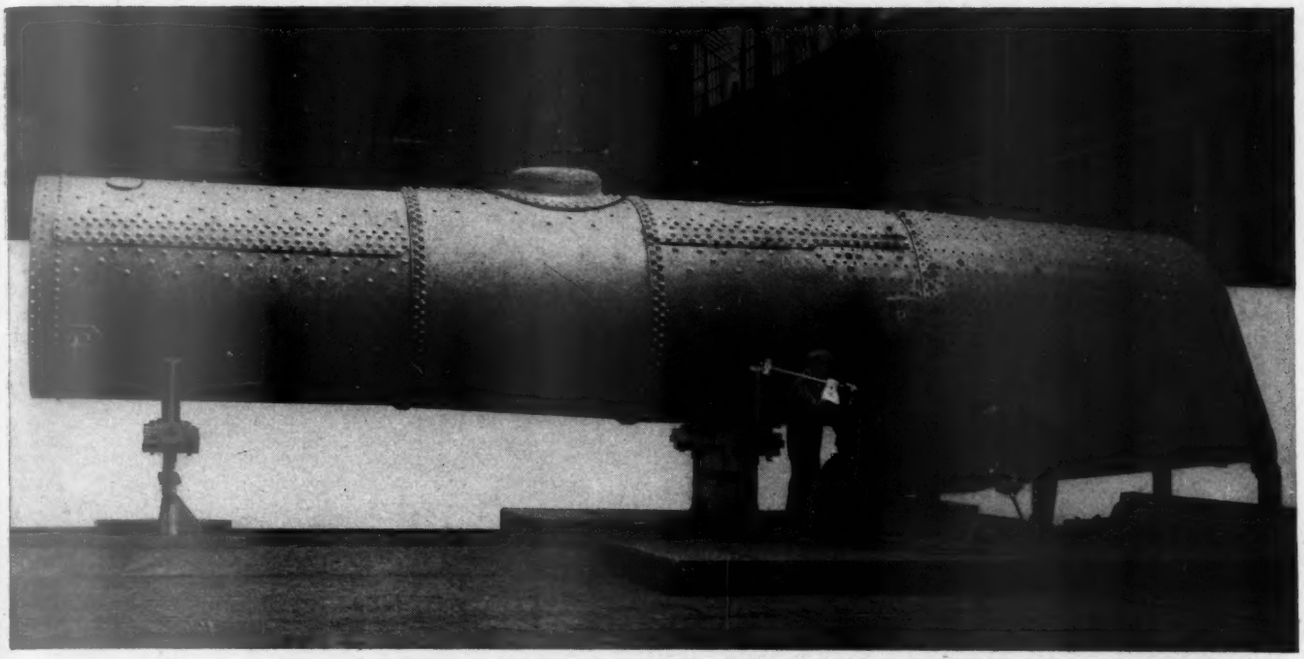

Through the use of this boiler jig perfect alignment between boiler shell and back end is assured. It is through such methods as this that Lima has earned its enviable reputation as a builder of low-maintenance steam power

Lima Locomotives

ARE BUILT FOR HARD WORK

"Availability" of locomotives is all important these days.

Those locomotives are most valuable that keep out of the shop.

Lima has always been keenly aware of this factor and has developed many special methods and tools to insure greater accuracy of manufacture and the resultant higher degree of availability.

Lima power is being worked hard today but Lima power is built to "take it".

LIMA LOCOMOTIVE WORKS LIMA LOCOMOTIVE WORKS INCORPORATED **INCORPORATED, LIMA, OHIO**

High Spots in
Railway Affairs . . .

Trainwomen

At this writing, the middle of February, the Pennsylvania Railroad has three women assigned to passenger trainman service on Philadelphia suburban trains. They perform the regular duties of passenger brakemen, and were required to pass rigid physical tests and be at least 21 years of age. Twenty-seven other women have made their student trips and will be assigned to Philadelphia suburban trains and Baltimore and Harrisburg locals. The uniform consists of a fitted blue coat with P. R. R. insignia on the lapels, a plain blue skirt, white shirt, black four-in-hand tie and a blue trainmen's hat. A top coat conforms closely to the regular trainmen's coat.

Mexican Rolling Stock Bottleneck Eliminated

American creditors, in an attempt to collect claims, have sought to attach Mexican railroad equipment which has entered this country. To avoid such seizure, an announcement of the Treasury Department of the United States states that "a large volume" of war materials has heretofore been transferred at the border from Mexican to United States cars. This has caused a serious bottleneck. To remedy this situation the Treasury Department has issued regulations barring all legal and other proceedings which might interfere with the free and unrestricted use and operation of Mexican railroad equipment within the United States. This will not, however, apply to service and repair charges and other claims arising on and after the date of the ruling (February 4), out of the operation within the United States of the rolling stock involved.

Traffic Prospects

Despite the fact that car loadings this year have been running below comparable weeks in 1942, Director Eastman of the Office of Defense Transportation believes that freight traffic in 1943 will exceed that of 1942 by 11 per cent on a ton-mile basis. This statement was made at a meeting of the directors of the Association of American Railroads late in January. The Bureau of Railway Economics now anticipates that passenger-miles in 1943 will be up 20 per cent, instead of 15 per cent, as it previously estimated. Director Eastman bases his anticipation of increased freight traffic on the demand for military transportation; the belief that the 1943 lake ore movement will exceed last year's record of 92 million tons; the increase in shipbuilding; increased grain shipments following upon the release of storage space as grain moves abroad; increased coal mining, and the further diversions from highway transport as the truckers experience further difficulty with rubber and manpower shortage.

"Austerity" Locomotives Used on British Roads

The Railway Gazette of London in its issue of January 1, 1943, states that "the American-built austerity locomotives which have arrived in this country have received wide publicity." It draws attention, however, to the fact that, contrary to popular belief, these do not set a precedent for the use of American-built locomotives in that country. In 1840—more than 100 years ago—locomotives built by Norris of Philadelphia were used for hauling trains up the Lickey Incline on the former Midland Railroad; some of these were still in use as late as 1860. In 1889 and 1900 a number of 2-6-0 locomotives built in the United States were acquired by British railways. After the first World War a number of 4-6-0 tank locomotives which were built for war service on light railways in France and other fronts were purchased for use on certain light railways in Great Britain.

Wanted—Railroad Watches

There is a shortage of railroad watches. The Consumers Durable Goods Division of the War Production Board has issued an appeal stating that, "Anyone having a railroad watch which he does not use for essential purposes can contribute to the war effort by selling it for railroad use." The watch should be taken to a railroad watch inspector. The nearest local jeweler can direct you to him; or an inquiry may be sent to the Watch and Clock Unit of the Consumers Durable Goods Division, WPB, Washington, D. C.

Bureaucracy Runs Riot

How long will the American people continue to stand for the bureaucrats in Washington who feed so voraciously on public patronage? No one can gainsay the fact that the Railroad Retirement Board requires a large staff, but the nature of its work is such that its staff of experts should possess certain technical ability and good, sound commonsense. The Railway Age points out that Maurice Parmelee is now employed as an economist by the Railroad Retirement Board at a salary of $4,600. He is the author of "numerous volumes, all of them revolutionary in character," and one of them advocating "the practice of universal nudism in office and factory." According to Representative Dies, chairman of the committee investigating un-American activities, Parmelee was dismissed by the Board of Economic Warfare after Dies' exposure of his activities, which included several years spent in European nudist camps. As Congressman Dies pointed out, however, "the great bureacratic family was not to leave Parmelee jobless for long."

East Coast Oil Movement

The tank car movements of petroleum and its products to the East Coast area averaged within a few thousand of 800,000 barrels a day during the last half of January, and are now probably bettering that figure. For the week ending January 23, they averaged 798,552 barrels a day, and for the following week ending January 30 they averaged 796,458 barrels a day. Recently about 700 tank cars formerly used for other products have been devoted to this purpose. Box car shipment of kerosene to New England in drums has also been increased—it averaged 8,266 barrels a day for the week ending January 30. Completion of several links in pipe line projects are proving helpful. One hundred box cars are also being fitted with linings for the transportation of oil, fifty with Flexitank Corporation "flexitanks" and fifty with Glenn L. Martin Company "Mareng-cells."

Job Too Big For One Man

Railroad labor organizations and the National Mediation Board, itself, have been concerned for several months because of the board being short-handed. Otto S. Beyer, one of the three members, was given an indefinite leave of absence about a year ago to accept full-time service as director of the Division of Transport Personnel of the Office of Defense Transportation. On February 1, David J. Lewis, a former Congressman from Maryland and now in his 74th year, retired as a member of the board. This left only the chairman, George A. Cook. The Railway Labor Executives Association complained that "for nearly two years the National Mediation Board . . . has been impaired by inadequate members and now there is only one member of the board." On February 11 President Roosevelt sent to the Senate the names of Dr. William M. Leiserson to succeed Mr. Lewis and Ex-Senator H. H. Schwartz of Wyoming to fill out the unexpired term of Captain Beyer.

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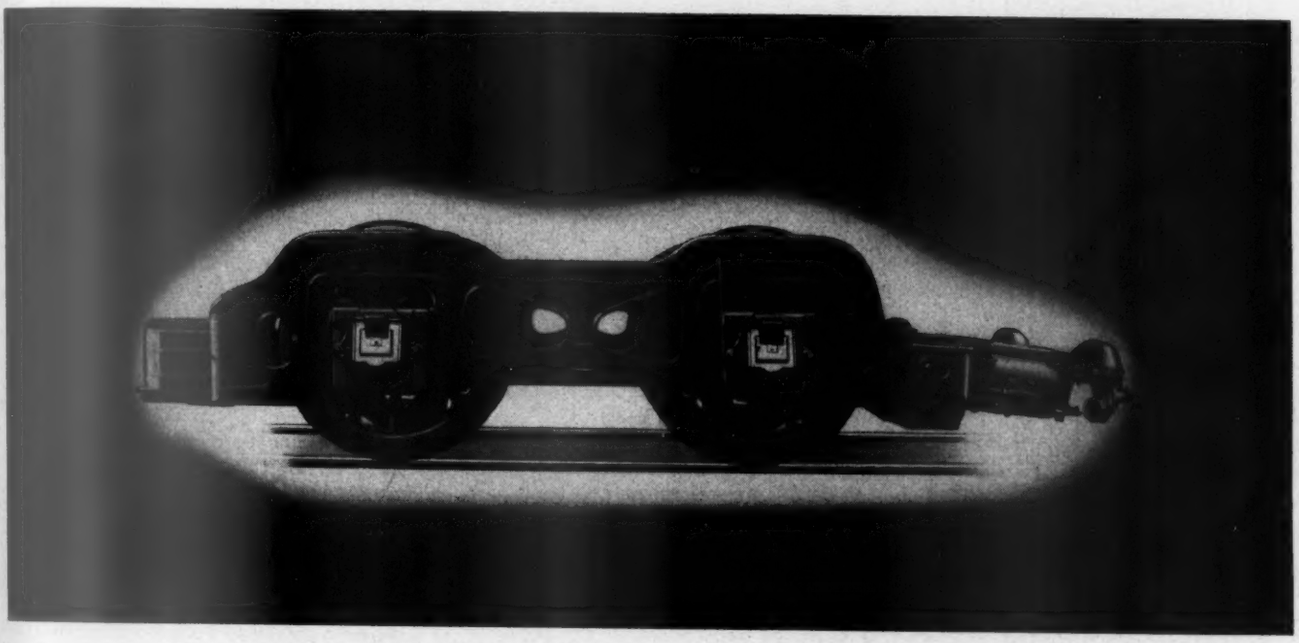
MORE TONS PER LOCOMOTIVE

WITH THE BOOSTER'S HELP



With locomotives loaded to capacity the Locomotive Booster is making it possible to move thousands of tons more freight every working day.

Booster-equipped locomotives have the extra power to get full tonnages moving and to accelerate to road speed from slow-downs.

By helping in any tight place, they are contributing importantly to the fine record of tons hauled per locomotive mile.

FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK CHICAGO

In Canada: FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL

NEWS

Kelly Replaces Kelly in ODT

H. H. KELLY has been appointed director of the Division of Material and Equipment Requirements of the Office of Defense Transportation, replacing Warren W. Kelly, who asked to be relieved of the responsibility of directing the division on account of his health. The latter Mr. Kelly will continue his association with the division in a consulting capacity.

ODT Promotes Mechanical Men

SHANNON KUHN, mechanical assistant of the Division of Railway Transport, Office of Defense Transportation, has been promoted to deputy director, and has been succeeded as mechanical assistant by J. D. Loftis, Jr., who has been locomotive assistant.

Mr. Kuhn, who came to ODT last June, was formerly master mechanic of the New York Central at its Cleveland, Ohio, shops. Mr. Loftis, who has been with ODT since last August, was formerly associated with the Denver & Rio Grande Western.

Tank-Car Brakes Need More Attention

A CIRCULAR letter, sent out by the A.A.R. Mechanical Division, under date of January 21, calls attention to a number of brake conditions which should receive more careful attention before tank cars are loaded and also after they have been made empty and before the return movement for another load.

Many cars are being cut out of trains and placed on repair tracks, particularly in loaded movement, on account of air brakes being cut out. When making air tests on such cars it has been found that approximately six out of every ten cars set out for this reason meet test requirements and should not have had their air brakes cut out. This condition can be overcome if more care is exercised in making air tests at terminal points when air-brake tests are made. Air brakes must be "in date" and in operative condition before being placed for loading or before being returned empty from point where unloaded.

Many cars, particularly tank cars, are said to be arriving at various terminals with increased cylinder piston travel, in many cases as much as 10 in. Cylinder piston travel must be adjusted to not less than 7 in. nor more than 9 in., preferably 8 in., before cars are placed for loading or before being returned empty from point where unloaded, as per A.A.R. Standard.

Many cars are being shopped en route because of loose air-brake cylinders, reservoirs and piping. Some cases are found where the entire train brake air line is loose, broken or leaking on account of not being properly clamped in place.

It is urged that all concerned take necessary action to condition air-brake equipment properly on tank cars before loading and before they are returned empty, in order to eliminate delays caused by cars being set out en route for repairs.

Vice-chairman V. R. Hawthorne points out that a review of the replies received to date on Form TCCO indicates that the major defects causing cars to be cut out of trains en route are brake-rigging defects, wheel defects, coupler and coupler part defects, broken train line and crossover pipes. This indicates that if greater care and attention were paid to maintaining concentric wheels under equipment, further effort made to prevent too much free slack in draft gears, and closer inspection of brake beams and brake rigging, a large number of defects on cars en route would be eliminated, all of which would improve the serviceable car days of equipment and further assist in the war effort in the present emergency movement of petroleum products to the eastern seaboard.

This same condition with respect to defects causing frequent shoppings of cars also applies to all classes of equipment, and if every effort were made to insure these defects being corrected before cars are placed for loading and at the time cars are made empty before being again offered for loading, a great number of these defects which occur en route would be eliminated and the serviceable car days of all types of equipment increased.

Equipment Installed on Class I Railroads in 1942

CLASS I railroads put 63,009 new freight cars and 712 new locomotives in service in 1942, according to the Association of American Railroads. This was the smallest number of new cars to be installed since 1939 but the greatest number of locomotives since 1930. It compares with the 80,502 new freight cars and 633 new locomotives put in service in 1941.

Of the new freight cars installed last year, there were 34,713 box, 23,144 coal, 2,938 flat, 631 refrigerator, 100 stock and 1,483 miscellaneous cars. The new locomotives installed included 308 steam and 404 electric and Diesel-electric compared with 161 steam and 472 electric and Diesel-electric in 1941.

Class I railroads on January 1 had 27,061 new freight cars on order, compared with 74,897 cars on the same date one year ago. The former figure included 7,301 box, 17,946 coal, 1,444 flat, 200 stock and 170 miscellaneous cars. New locomotives on order on January 1 totaled 888, which included 355 steam and 533 electric and Diesel-electric. On January 1, 1942, there were 546 on order—258 steam and 288 electric and Diesel-electric.

WPB Plans Release of Most of 20,000 Cars for First Half of 1943

THE War Production Board is reported to have granted authorizations for the building of 19,810 of the 20,000 cars planned for delivery during the first six months of 1943. Of this number, 4,585 were allocated to five railroad shops and 15,225 to seven contract car-builders. Although the 19,810 cars released included a number ordered in January, 1943, most of the cars to be built were on order but "frozen" at the year-end. The majority of the cars will be of composite wood and steel.

General Young Appointed Deputy Director, ODT

BRIGADIER GENERAL CHARLES D. YOUNG has been appointed deputy director of the Office of Defense Transportation under a directive issued on January 16 by Director Eastman. The directive stipulated that, in the absence of the director from Washington, General Young "may act for him on matters requiring immediate attention."

Also, he will "advise and assist the Director and subject to him will have direction and control in all matters pertaining to the responsibilities of this office as a claimant agency in the War Production Board;" and "assist the Director and perform such other duties as may be assigned to him."

General Young, a former vice-president of the Pennsylvania, has been assistant director of ODT since his retirement from active army service last June. Prior to that tour of duty he was director of ODT's section of materials and equipment, predecessor to the present division of material and equipment requirements.

Rail Manpower Committee Considers Replacement Schedule

THE Rail Manpower Committee, appointed at the request of the Office of Defense Transportation to represent Class I roads, "has given favorable consideration to the Replacement Schedule which has been prepared by the Selective Service System to provide an orderly control of the withdrawal of Selective Service eligibles from industry," according to an announcement from ODT on January 28.

Meanwhile at the general meeting the representatives of the Manpower Commission sought cooperation of the railroads in developing a railroad training program. In that connection it was recognized that some of WMP's training facilities are already being utilized by railroads, the foreman training program having been "particularly well received." Other discussions at the meeting included a talk by Dorothy M. Sells, chief of the Personnel

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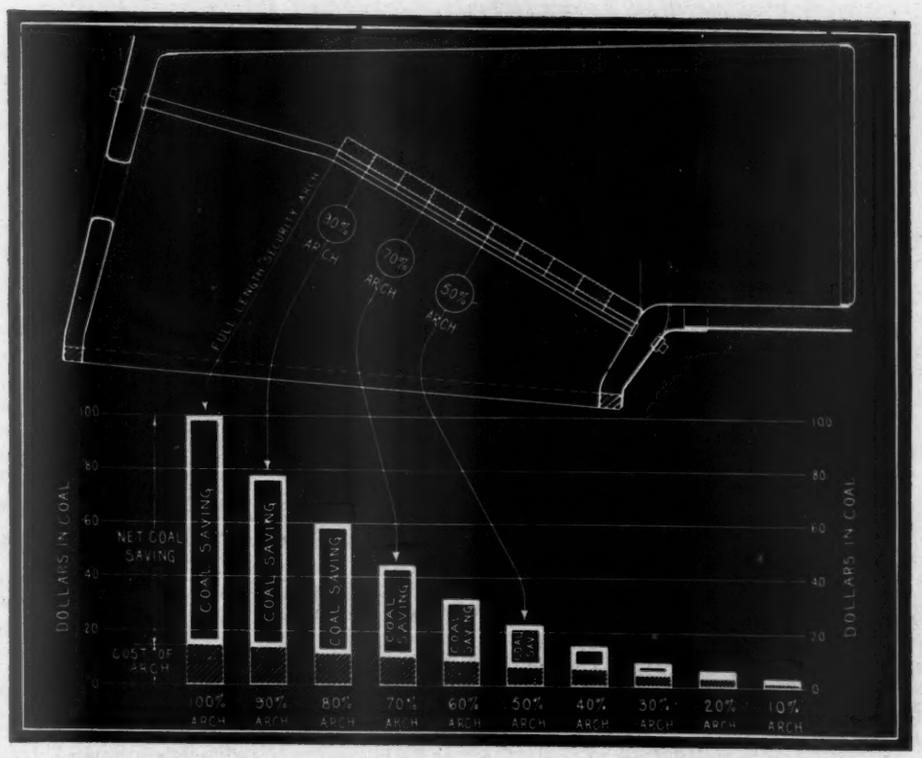


THE EFFECT OF ABBREVIATED ARCHES ON FUEL SAVING

FUEL CONSERVATION... a wartime need!

Fuel wastage is a two-fold loss; the fuel itself and the transportation necessary to haul it. Because of the strategic importance of fuel to the war program every effort must be made to conserve this vital material.

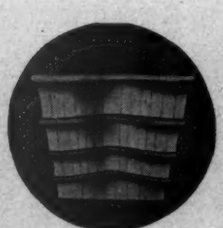
The fuel economy of Security Sectional Arches has been thoroughly proved in over 32 years of service on American railroads. But only a *complete* Arch can produce maximum fuel savings.

You need a full Arch for full fuel economy.

THERE'S MORE TO SECURITY ARCHES THAN JUST BRICK

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists



AMERICAN ARCH CO.
INCORPORATED
60 EAST 42nd STREET, NEW YORK, N. Y.
Locomotive Combustion Specialists

Supply Section of ODT's Division of Transport Personnel, who recently returned from England, where she studied utilization of British women to meet manpower shortages in transportation.

The Rail Manpower Committee is headed by Dr. Julius H. Parmelee, director of the Bureau of Railway Economics; while ODT representatives at the meeting were headed by Otto S. Beyer, director of the Division of Transport Personnel.

Equipment Purchasing and Modernization Progress

New York Central.—A contract has been awarded to the Walsh Construction Company, for the replacement of twelve 97-ft. engine stalls with 16 stalls at Bellefontaine. Of the new stalls 13 will be 130 ft., 2 will be 110 ft., and one 95 ft. in length.

Pennsylvania.—The Pennsylvania company has applied to the Interstate Commerce Commission for authority to assume liability for $6,450,000 of equipment trust certificates, series N, to be applied to the purchase of part of certain equipment of a total cost of about $15,300,000, which will be supplemented at a later date by an application for authority to assume additional liability if more of the equipment becomes available. It is proposed to purchase under this arrangement five electric passenger locomotives, 51 steam locomotives, 30 locomotive tenders, six Diesel-electric switching locomotives, and 1,000 heavy-duty gondolas, but authority is sought to substitute other equipment of equivalent value under the trust if portions of the specified equipment are not available. With the exception of the Diesel-electric switching locomotives, the equipment is to be constructed in the company's shops.

The Pennsylvania has invited bids for the purchase of $6,450,000 of the equipment trust certificates, which are part of a proposed aggregate issue of $12,240,000 of certificates under the railroad's equipment trust series N.

The 1,000 heavy-duty gondola cars will be of 70 tons' capacity with wood planking used temporarily in the side sections to conserve steel. War Production Board approval has been obtained for construction of the cars, which have been designed so that after the war the plank side sections can be replaced readily with steel plates to assure the long-term durability of all-steel construction. The underframe and trucks are of steel, and steel posts and braces are provided for the temporary plank side sections. (The railroad already has in operation 1,500 open-top freight cars of composite wood and steel design which also incorporate provision for replacing the plank sections with steel after the war. Of these, 500 are 70-ton gondolas, 500 are 50-ton gondolas and 500 are 50-ton hopper cars.) The construction program calls for all of the new cars to be in service during the first half of 1943. Total cost is estimated at $3,150,000.

St. Louis-San Francisco.—This road has filed a petition in the District Court seeking permission to spend $3,103,485 in 1943 for rails, equipment and improvements. The program includes, among other projects, the improvement of freight cars; the modernization of passenger equipment; and the purchase of new parts for 165 locomotives. Of the total, $2,711,418 will be for the Frisco and the remainder will be spent on subsidiaries.

Southern Pacific.—Division 4 of the Interstate Commerce Commission has authorized the Southern Pacific to assume liability for $3,950,000 of equipment trust certificates, series U, to be issued to finance in part the purchase of 22 locomotives. The certificates will mature serially in 10 equal annual installments, the five first due to bear interest at two per cent and the others at 2½ per cent.

Eastman Sees 11 Per Cent Increase in Ton-Miles

DESPITE the fact that carloadings in recent weeks have been below those of comparable 1942 weeks, Director Eastman of the Office of Defense Transportation still thinks that 1943 freight traffic, as measured by ton-miles, will be 11 per cent in excess of the 1942 volume. Mr. Eastman expressed this view to directors of the Association of American Railroads at their meeting in Washington, D. C., on January 29.

He said that ODT had recently reexamined the 11 per cent estimate on which it agreed with the A. A. R. some time ago, and saw no reason to change it. Likewise, the current Bureau of Railway Economics estimate places the 1943 ton-miles from 10 to 11 per cent above 1942, while it now anticipates that passenger-miles will be up 20 per cent instead of the 15 per cent previously estimated.

Among the reasons which Mr. Eastman gave for adherence to the traffic-rise estimate were the increased demand for military transportation; the expectation that next season's lake-ore movement will be above 1942's record of 92,000,000 tons; the increase in shipbuilding; increased grain shipments following upon the release of storage space as grain moves abroad; the possibility of increased coal mining; and the prospects for further diversions from highway transport as truckers experience continuing difficulties as a result of the rubber shortage and their manpower problem which was said to be more acute than that of the railroads.

North Western Streamliner Diesels Do 517 Miles a Day

THE five Diesel-electric locomotives used by the Chicago & North Western on its fleet of "400" streamliners have averaged 517 miles per day each during the first year of operation. The five locomotives were ordered early in 1941 for use on seven streamline trains operating between Chicago and Milwaukee, Wis., Green Bay, Madison, Oshkosh, Manitowoc, Escanaba, Mich., Negaunee, and Ishpeming and the last was delivered in August of that year. Up to January 12, 1943, they had traveled 943,332 miles, excluding the mileage accumulated during several months of test runs prior to going into regular service.

1942 Locomotive Shipments

LAST year's shipments of railroad locomotives totaled 1,602, as compared with 970 in 1941 and 587 in 1940, according to reports made by builders other than railroad shops to the Department of Commerce's Bureau of the Census. The 1942 total included 715 steam locomotives, 22 electrics, 787 Diesel-electrics, and 78 of other types, as compared with 1941 shipments of 182 steam locomotives, 18 electrics, 712 Diesel-electrics, and 58 of other types.

On December 31 the builders had unfilled orders for 1,967 locomotives, including 1,139 steam, 43 electrics, 781 Diesel-electrics, and four of other types. At the close of 1941 the unfilled orders totaled 1,210 locomotives, including 526 steam, 49 electrics, 584 Diesel-electrics, and 51 of other types.

Data supplied by the Car Service Division, Association of American Railroads,

(Continued on next left-hand page)

Orders and Inquiries for New Equipment Placed Since the Closing of the February Issue

LOCOMOTIVE ORDERS

Road	No. of Locos.	Type of Loco.	Builder
Broder Co. Port Authority, Ft. Lauderdale, Fla.	1[1]	600-hp. Diesel-elec.	Electro-Motive Corp.
Central of Georgia	8[2]	4-8-4 (pass.-frt.)	Lima Loco. Wks.
Lehigh Valley	10[1]	4-8-4	American Loco. Co.
Nashville, Chattanooga & Tennessee.	10[1]	4-8-4	American Loco. Co.

LOCOMOTIVE INQUIRIES

Chesapeake & Ohio	25	2-8-4

FREIGHT-CAR ORDERS

Road	No. of Cars	Type of Car	Builder
Atchison, Topeka & Santa Fe	200[3]	70-ton gondola	Pullman-Std Car Mfg. Co.
Chesapeake & Ohio	500[3]	50-ton hopper	Pullman-Std Car Mfg. Co.
	500[3]	50-ton hopper	American Car & Fdry. Co.
	500[3]	50-ton hopper	Gen.-Amer. Trans. Corp.
New York Central	1,000[3]	Gondola	Despatch Shops, Inc.
	300[3]	Flat	Despatch Shops, Inc.
Northern Pacific	300[1]	50-ton flat	American Car & Fdry. Co.

FREIGHT-CAR INQUIRIES

Chicago & North Western	250	70-ton ore

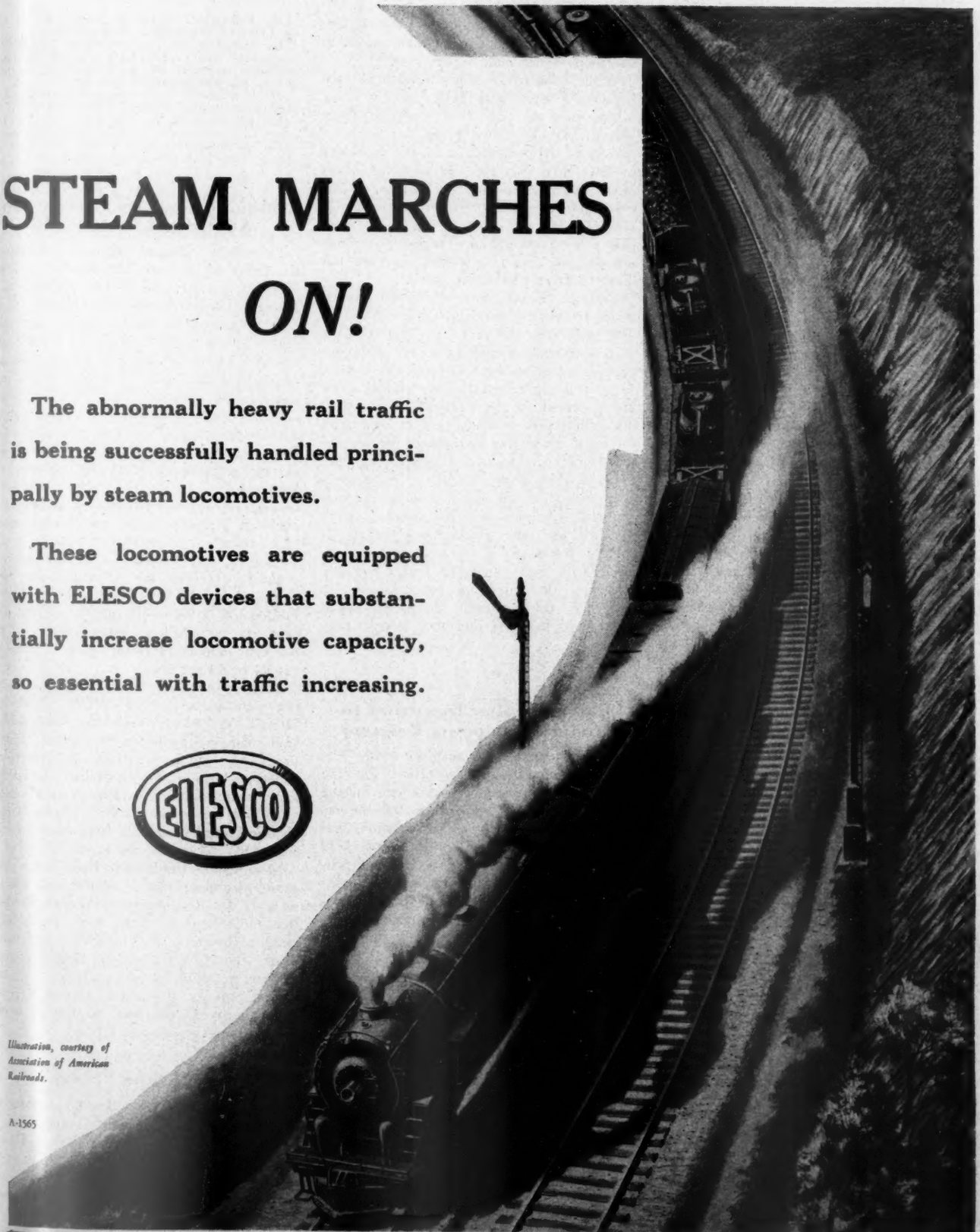
[1] Authorized by WPB.
[2] Authorized by WPB. Order originally placed with the Baldwin Locomotive Works. Deliveries expected to begin in June.
[3] Order and approval of WPB unconfirmed.

STEAM MARCHES *ON!*

The abnormally heavy rail traffic is being successfully handled principally by steam locomotives.

These locomotives are equipped with ELESCO devices that substantially increase locomotive capacity, so essential with traffic increasing.

ELESCO



Illustration, courtesy of Association of American Railroads.

A-1565

THE SUPERHEATER COMPANY

SUPERHEATERS • FEEDWATER HEATERS
AMERICAN THROTTLES • STEAM DRYERS
EXHAUST STEAM INJECTORS • PYROMETERS

Representative of
AMERICAN THROTTLE COMPANY, INC.
60 East 42nd Street, NEW YORK
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Montreal, Canada
THE SUPERHEATER COMPANY, LTD.

on locomotive building in railroad shops show that 82 locomotives, including 64 steam and 18 electrics, were thus produced in 1942, as compared with a 1941 total of 24 locomotives, including 20 steam and four electrics. On January 1 railroad shops had unfilled orders for 105 locomotives, including 92 steam and 13 electrics.

Over 100,000 Women Relieve Manpower Shortage on British Railways

More than 100,000 women now are employed on the railways of Great Britain, including the London Transport Board operations, out of a total of some 600,000 employees, according to a statement by Dorothy Sells, of the Division of Transport Personnel of the Office of Defense Transportation, issued in Washington after her return from a three-months' investigation of the employment of women in England to meet manpower shortages in the transportation industry.

While the greater number of women employees are engaged in unskilled and semi-skilled jobs, "a good many" are doing highly skilled work, she said. As a result of the acute manpower shortage, which has led to the development of mechanical lifting devices and to "de-skilling" mechanical operations, women are employed to some extent on heavy work normally requiring great physical strength, or in tasks involving a relatively high degree of mechanical skill, and others are found in such jobs as blowing out boiler tubes, laying rails, steam-cleaning wheels from pits, lifting ashes, and lubricating locomotives.

Miss Sells reported that practically no evidence of opposition to the employment of women was expressed by railroad men in Great Britain. The National Service Act provides that men in the services can return to their former jobs when the war ends, and union agreements provide that women shall get the same pay as men if they do the same work, she pointed out, so that two important possible causes for friction are eliminated. In general, Miss Sells added, the women look upon their work in the transportation industries as part of the war effort, not as a field for future employment.

Many women have been working as much as 60 hours per week, the ODT investigator reported, but the tendency is to shorten the working week somewhat below this level. On the other hand, in many instances it has been more satisfactory, she said, to employ women on a part-time basis, so that their strength would not be taxed in difficult jobs, and also to permit them to take care of their homes and community obligations without making a bad record for absenteeism.

On the British railroads Miss Sells found very few women in train-service work, and these were "guards" on little-used branch lines. On the other hand, they are employed widely in stations and to some extent in shops, she reported. There are a great many women train announcers, check room attendants, baggage porters, and "platform porters" (freight handlers). A few women are stationed in branch line "signal boxes," and a good many work in the shops under male supervision.

While women do as much work as men in certain jobs, Miss Sells said, in many others they do not. For example, three women platform porters do the work of two men. In the shops it is still necessary to have men "set-up" the work on many of the machines operated by women. While close supervision of women is frequently required, it very often is possible to employ super-annuated men employees for this purpose, so that able-bodied men are not diverted from productive work.

Perhaps 80 per cent of British women transportation workers are trained on the job, she said, but the railroads provide schools to train certain classes of employees, such as ticket sellers and platform porters. Some training courses in mechanical work are provided by the railroads, she added, but government training centers, originally set up to train the unemployed before the war began, give most of the formal instruction in this field. In these eight-week courses women are taught fundamental mechanical principles, blueprint reading, safety methods, and other rudimentary topics.

As a result of her observations in England, Miss Sells indicated that the ODT program for employing more women in American transportation industries would be revised in spots and then widely promoted.

Rail and Labor Executives to Promote Manpower Program

Working under the auspices of the Office of Defense Transportation for the "alleviation of manpower problems in the railroad industry," spokesmen for the regional railroad executives' associations and railway labor organizations on January 29 unanimously agreed upon a 13-point program in the form of a "statement of principles," which leaves to individual managements and system labor organization representatives the job of carrying out "each step by agreement."

The 13-point program, as set forth in the ODT announcement, follows:

1. Relaxation of yard operating rules to permit crews delivering cars to the yards or tracks of another road to haul back cars to their own road, so as to give the engine a load in both directions.
2. Continued employment, as long as physically able, of men eligible for retirement under the Railroad Retirement Act.
3. Cooperation of management and workers to reduce absenteeism to a minimum.
4. Relaxation of road mileage limitations and of hourly limitations in yard service.
5. Efforts by labor and management to work present forces full straight time and to distribute uniformly such overtime as may be required.
6. Upgrading and promotion within or without any group, seniority being retained in the original group, so as to bring about fullest possible utilization of training and skills of present employees and minimize problems of obtaining and inducting new employees.
7. Transfer of shop work from one railroad to another to meet critical labor shortages. Transfer of employees from one railroad to another, with preservation of seniority rights on original job.
8. More intensive on- and off-job training, and provision for some pre-employment training. Consideration of payment of compensation during pre-employment training periods.
9. Cooperative effort to encourage return of retired employees.
10. Relaxation, so far as practicable, of age and physical examination requirements.
11. Induction of new employees, so far as practicable, into lower skilled brackets so as to minimize the need for pre-employment training and to expedite on-the-job training.
12. Consideration of employment of women of railroad employees' families.
13. Relaxation of the present 16- to 21-year age limits for employment of shop craft apprentices, so as to permit training of men who will be able to remain in service.

Claimant Agencies Receive First Allotments Under CMP

Fourteen claimant agencies, including the Office of Defense Transportation, have received from the War Production Board's Requirements Committee their first allotments of steel, copper, and aluminum under the Controlled Materials Plan. The allotments are for the second quarter of this year, but the WPB announcement pointed out that claimant agencies "are authorized to make plans for continuation of current programs into subsequent quarters on the basis of declining percentages of second quarter allotments."

Details of the distribution among the claimant agencies were not made public "for reasons of military security"; although it was revealed that the overall requests exceeded the 15-million-ton carbon-steel supply by 17 per cent, the two-million-ton alloy-steel supply by 15 per cent, the 600,000-ton copper supply by 16 per cent, and the 600-million-lb. aluminum supply by 14 per cent.

Thus presumably the ODT program was cut substantially; for WPB Chairman Donald M. Nelson said that "full provision" had been made for the current "must" programs, which he listed as "synthetic rubber, high-octane gasoline, aviation, army materiel, merchant and naval shipping and escort vessels." He added that "less essential programs have been cut to the bone."

Meanwhile, Ferdinand Eberstadt, program vice-chairman of WPB and chairman of the Requirements Committee, said that the allotments were "kept within our material budget"; and thus Mr. Eberstadt thinks that CMP has been launched with a view to achieving its main purpose "to assure delivery of material needed to produce approved programs, to deliver it on time in the exact amount."

WPB Defines "Scrap"

The War Production Board's distinction between the terms "dismantle" and "scrap," as used in its Limitation Order L-97 as amended—the provisions of which were outlined in February issue, page 107—is clarified by Interpretation No. 1 to that order, issued February 15. "Dismantle," as the term is used in this order, means to remove or strip all usable parts from a locomotive for re-use on other locomotives and then to scrap the remaining material. "Scrap" is used to indicate conversion of the entire locomotive to scrap without removing any parts for re-use. These definitions are the basis of distinctions in authorizations under the order applied for on Form PD-747.

Supply Trade Notes

BEAVER PIPE TOOLS, INC.—*W. A. Neracher,* founder and president of Beaver Pipe Tools, Inc., Warren, Ohio, has been elected to fill the newly created position of chairman of the board. *W. A. Phillis,* formerly vice-president, becomes president and general manager; *M. W. Bechtel,* executive vice-president and treasurer; *C. W. Shafer,* vice-president manufacturing; *E. R. Barkley,* vice-president, sales, and *R. C. Mellinger,* vice-president, accounting.

◆

JOSHUA HENDY IRON WORKS.—The Joshua Hendy Iron Works of Sunnyvale, Calif., has acquired the *Crocker-Wheeler Electric Manufacturing Company* of Ampere, N. J., and the *Pomona Pump Company* and its subsidiary, the *Westco Pump* division, of Pomona, Calif., and St. Louis, Mo.

◆

LOCOMOTIVE FIREBOX COMPANY.—*M. A. Foss,* assistant vice-president of the Locomotive Firebox Company, has been elected vice-president, with headquarters as before at New York.

◆

STANDARD CAR TRUCK COMPANY.—*J. C. Bloomfield,* sales representative of the Standard Car Truck Company, Chicago, has been promoted to assistant to vice-president.

◆

A. M. BYERS COMPANY.—*M. C. Morgan,* formerly field service engineer, has been appointed assistant Pittsburgh, Pa., division sales manager of the A. M. Byers Company.

◆

AMERICAN STEEL FOUNDRIES. — *The Charles F. Elmes Engineering Works* became a part of American Steel Foundries on December 31, 1942. *Charles F. Elmes* has remained as general manager and the present Elmes organization will continue intact and operate as a separate unit.

◆

CARBOLOY COMPANY, INC.—*A. F. Dobbrodte* has been appointed southern district manager of the Carboloy Company, Inc. Mr. Dobbrodte, whose headquarters are at 1719 Comer building, Birmingham, Ala., has been with the Carboloy Company since 1929. His activities have covered the design, sales and servicing of Carboloy cemented carbide tools in the Chicago, Milwaukee, Rochester, and Cleveland areas. His territory now includes Tennessee, Florida, Mississippi, Alabama, Texas, Georgia, and Louisiana.

◆

SOCONY-VACUUM OIL COMPANY.—*Don B. Alexander, R. O. Nash,* and *E. D. Kruger* have been appointed special representatives, Railroad Division, of the Socony-Vacuum Oil Company, with headquarters in Cleveland, Ohio; St. Louis, Mo., and Kansas City, Mo., respectively. *J. G. Christopher,* for the past several years industrial sales manager of the New York City division, has been appointed eastern manager of railroad sales, with headquarters at New York.

Mr. Christopher began service in 1910 in the foreign accounting department of the Standard Oil Company of New York, and later became a member of the sales organization of the Vacuum oil company, which merged with the Standard Oil Company of New York. He served in the sales organization in Chicago, Indianapolis, Ind., in upper New York state, and in the New York city area. Mr. Christopher subsequently became lubricating oil manager, New York City division of Socony-Vacuum, and later industrial sales manager.

◆

AMERICAN STEEL & WIRE CO.—*Charles H. Eisenhardt* has been appointed assistant manager of the electrical, wire rope and construction materials sales division of the American Steel & Wire Co., a United States Steel subsidiary, succeeding *R. L. Rhodes,* resigned. Mr. Eisenhardt has been associated with the wire company since May, 1925, when he was employed as a stenographer in the Baltimore, Md., sales office. He was successively a price clerk, correspondent and salesman in the Baltimore office before being assigned to the position of special sales representative in Washington, D. C., in August, 1942.

◆

ALLEGHENY LUDLUM STEEL CORPORATION.—*Arnold W. Nelson* has been appointed district representative in the Minneapolis, Minn., territory for the Allegheny Ludlum Steel Corporation, to succeed the E. L. Sandberg Company. *F. B. Lounsberry,* vice-president in charge of manufacturing, has transferred his headquarters from Watervliet, N. Y., to the Allegheny Ludlum general offices at Brackenridge, Pa. *Dr. G. M. Butler,* research engineer in the Dunkirk, N. Y., laboratories of the corporation, has been appointed chief metallurgist in charge of technical control and research. *Robert H. Gibb,* assistant district manager of the corporation at Pittsburgh, Pa., has been appointed district manager at Pittsburgh, Pa., office.

◆

COPPERWELD STEEL COMPANY. — The Copperweld Steel Company has consolidated its former southwestern and southeastern districts into a new southern district under the supervision of *E. B. Patterson,* southern sales manager, with offices at Memphis, Tenn. The new district comprises the states of New Mexico, Texas, Oklahoma, Louisiana, Arkansas, Tennessee, Mississippi, Alabama, Georgia, North Carolina, South Carolina and Florida. Southern district branch offices will be maintained at Dallas, Tex., and Atlanta, Ga.

◆

GENERAL ELECTRIC COMPANY.—*A. W. Baker* has been appointed transportation specialist of the Atlanta, Ga., transportation department of the General Electric Company, to succeed the late F. A. Kroner.

◆

E. W. HUSEMANN has been appointed metallurgist in the Metallurgical Department of the Copperweld Steel Company at Warren, Ohio. Mr. Husemann was formerly with the Republic Steel Company at Chicago.

◆

AMERICAN BRAKE SHOE & FOUNDRY COMPANY, AMERICAN MANGANESE STEEL DIVISION.—*James R. Hewitt,* formerly assistant to the vice-president, has been appointed vice-president of the American Manganese Steel division of the American Brake Shoe & Foundry Co.

◆

BY-PRODUCTS STEEL CORPORATION. — *Raymond M. Dennis* has been appointed assistant to the president of the By-Products Steel Corporation, a subsidiary of the Lukens Steel Company, Coatesville, Pa. Mr. Dennis had been general manager of the flanging department of Lukens. *John S. Morris* has been appointed methods engineer.

◆

CATERPILLAR TRACTOR COMPANY.—*James H. Deaderick,* assistant general parts manager of the Caterpillar Tractor Company since February, 1941, has been named a vice-president of the company with administrative direction of the parts, service and traffic departments. Mr. Deaderick studied at the University of California until 1925, leaving to engage in the contracting business. He joined the San Leandro, Calif., offices of the Caterpillar Tractor Company as a service department employee in 1929, was transferred to Peoria, Ill., in 1930, and subsequently appointed assistant service manager in 1933. He returned to California as western service manager in 1934 and became assistant sales manager of the western division in 1939. He returned to Peoria as assistant general parts manager in 1941.

Army-Navy Production Awards

Recognition of high achievement in the production of war equipment has been made by the presentation of the Army-Navy "E" to the following companies:

American Steel & Wire Co. (U. S. Steel subsidiary), Worcester, Mass. (Renewal of Navy "E" award bestowed on June 17, 1942.)

Crane Company, Chicago. January 29.

DeVillbiss Company, Toledo, Ohio. January 11.

Fairbanks, Morse & Co. Freeport, Ill., January 13; Beloit, Wis., January 18; Three Rivers, Mich., January 21.

General Motors Corporation, Electro-Motive Division, LaGrange, Ill.

General Motors Corporation, Hyatt Bearings Division, Harrison, N. J.

Pullman-Standard Car Manufacturing Company, Hammond, Ind. January 15.

(*Turn to second left-hand page*)

Distinguished Service

ON THE GREAT NORTHERN

4050 Hp. GM Diesel Freight Locomotive operating between Walton and Summit.

GREAT NORTHERN

GENERAL MOTORS LOCOMOTIVES

ELECTRO-MO

GENERAL MOTORS CORPORATION

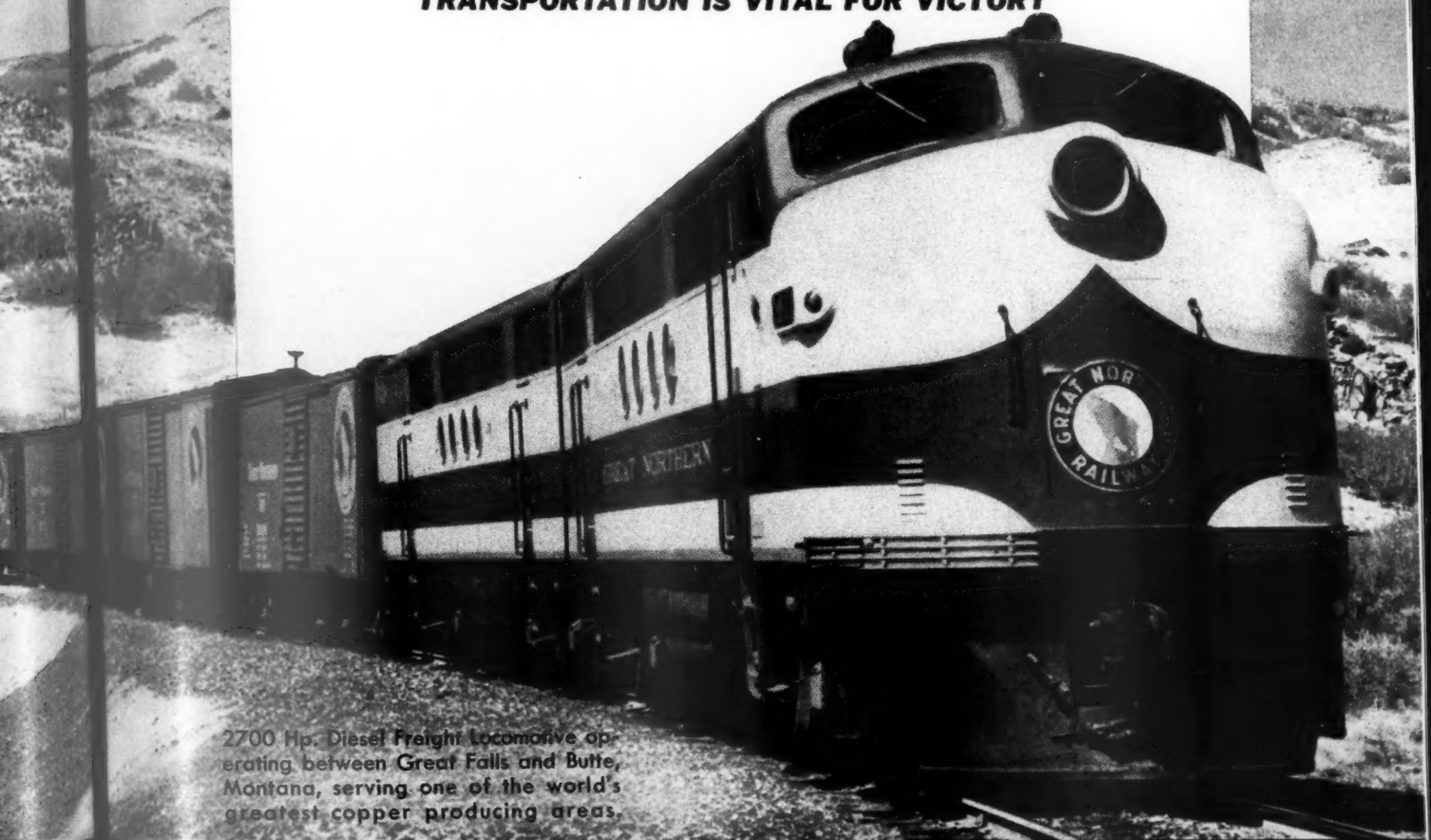
GM DIESEL FREIGHT LOCOMOTIVES
Solve Vital War Problems

GREAT NORTHERN 2700 Hp. Diesel Freight Locomotive No. 5600, operating between Great Falls and Butte, Montana (170 miles), and serving one of the world's greatest copper producing areas, has met every test — solved every problem — with typical super-performance, as evidenced by the following comparisons with steam locomotives previously used.

- **Diesel has increased maximum tonnage more than 47 percent on 2.2 percent grade — running time reduced four hours in each direction.**
- **In 62 days of operation Diesel saved 20 round trips — 6800 train miles; also saved 36 helper trips — 2103 helper miles. Helper service was entirely eliminated on a 54-mile district and reduced 50 percent on a 10-mile district.**
- **GM Diesel efficiency is not affected by altitude or extreme temperatures.**
- **GM Diesel has eliminated smoke and gas hazards in tunnels and fire hazard along right of way.**

WHY DID THE GREAT NORTHERN ADOPT GM DIESELS? The abnormal demand for copper, one of the most vital war materials, required either rebuilding the line to accommodate heavier steam power or adopting GM Diesels which had already demonstrated their ability to outperform steam without expensive changes in operating facilities. GM DIESEL LOCOMOTIVES positively reduce wear and tear on track and bridge structures. To even approach this Diesel performance with steam power would have required an expenditure of $350,000 to $500,000 for reducing grades, reinforcing bridges, enlarging tunnels and installing new turntable — an amount considerably more than the cost of the Diesel.

TRANSPORTATION IS VITAL FOR VICTORY



2700 Hp. Diesel Freight Locomotive operating between Great Falls and Butte, Montana, serving one of the world's greatest copper producing areas.

...O'VE DIVISION

...N LA GRANGE, ILLINOIS, U. S. A.

JOHNS-MANVILLE SALES CORPORATION.—*Carl S. Clingman,* general sales manager of the Transportation department of the Johns-Manville Sales Corporation, has been elected a vice-president of the company. *Albert C. Pickett,* formerly assistant sales manager of the western division of the transportation department, has been appointed sales manager, western division, with headquarters at Chicago; *John D. Johnson,* formerly central division sales manager, has been appointed acting sales manager, eastern division, with headquarters at New York, to succeed *P. E. Redding,* who has been called to active duty as a lieutenant in the U. S. Naval Reserve, and *Fred Fix* has been appointed acting sales manager of the central division, with headquarters at Cleveland, Ohio, to replace Mr. Johnson.

Carl S. Clingman

Mr. Clingman was educated at Northwestern University. He began his business career in 1904 as an apprentice with the Pullman Company, and was promoted to the position of assistant general shop foreman at the Pullman, Ill., works in 1907. He was transferred to Wilmington, Del., as eastern mechanical inspector in 1908 and was appointed general mechanical inspector at Chicago in 1909. He entered the service of Johns-Manville in 1917, as sales representative in the southwest; was appointed sales manager of the western region in 1933, and general sales manager of the transportation department, with headquarters in Chicago, in 1935. As vice-president, Mr. Clingman will continue also as general sales manager of the transportation department.

Mr. Pickett joined the engineering department of the Missouri-Kansas-Texas in 1916, remaining there until 1917, when he was transferred to the stores department and appointed storekeeper at Trinity, Tex. After serving in the Army during World War I, he returned to the M-K-T in 1920 to serve on the staff of the chief engineer. He joined the Johns-Manville Sales Corporation as sales representative in 1922, and was appointed division sales manager of the southwestern division, with headquarters at St. Louis, Mo., in 1933. He resigned from Johns-Manville in 1939, returning in 1941, as assistant division sales manager of the western division.

Mr. Johnson received his early mechanical and engineering training in railroad service, working from 1907 to 1919 in the mechanical departments of the New York Central, the Missouri Pacific, and the Baltimore & Ohio. He entered the service of Johns-Manville as a salesman in the transportation department in 1920 and was appointed division sales manager of the central division in 1930.

After completing his schooling, Mr. Fix entered the service of the New York Central at Cleveland. In 1924 he entered the transportation department of Johns-Manville at Cleveland.

◆

BENNETT S. CHAPPLE, formerly assistant to the vice-president, operations, in charge of emergency defense coordination, has been appointed assistant manager of sales of the New York district sales office of the Carnegie-Illinois Steel Corporation. Mr. Chapple, before the emergency, was the company's manager of sales promotion.

◆

JOHN E. WRIGHT, formerly with the American Steel Foundries, has been appointed regional sales manager, railway division, of the Edward G. Budd Manufacturing Company, and will be in charge of a new office opened by the company in the Railway Exchange building in St. Louis, Mo. Mr. Wright is a graduate of George Washington University. His headquarters have been in St. Louis since 1926, when he took over the southwest territory as the representative of the American Steel Foundries.

John E. Wright

◆

GUSTIN-BACON MANUFACTURING COMPANY.—*E. N. Sleight,* acting manager of the Chicago office of the Gustin-Bacon Manufacturing Company, Kansas City, Mo., has been promoted to the position of manager in charge of sales in the Chicago area. Mr. Sleight graduated from Purdue University in 1931. He was later employed by the Association of American Railroads in connection with research work on chilled-steel car wheels and brake shoes. He entered the employ of Gustin-Bacon at Kansas City in May, 1937, and later that year was assigned to the Chicago office as a sales representative. In November, 1941, he was appointed acting manager of the Chicago office.

J. G. BRILL COMPANY.—*Ronald R. Monroe,* vice-president of the J. G. Brill Company, has been elected president, to succeed *Leslie E. Hess,* who is now chairman of the board. *Charles J. Hardy,* former chairman, will continue as chairman of the Executive committee. Mr. Monroe was elected vice-president of the Brill company when he joined that organization in February, 1942. He was graduated from the University of Michigan in 1915 and gained his early business experience in the middle west, where he was president of the Des Moines (Iowa) Foundry & Machine Co. for several years and director of two other manufacturing companies. He became director and executive vice-president of the Utilities Power & Light Corporation in 1935, and during the reorganization of that company served as executive assistant to the trustee. For the past several years Mr. Monroe has served on the industrial advisory committee of the Federal Reserve Bank of Chicago. He holds directorships in the Missouri Utilities Company and the Black Hills Power & Light Co.

Ronald R. Monroe

Obituary

JAMES G. BLUNT, assistant to the vice-president in charge of engineering of the American Locomotive Company, died on February 15 at Schenectady, N. Y.

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HENRY C. PIERLE, secretary and general sales manager of the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, died on January 14 after a short illness. He was 62 years old.

◆

SAMUEL B. FORTENBAUGH, retired railway electrification engineer formerly with the General Electric Company, died on February 5. He was 73 years of age. Mr. Fortenbaugh joined the engineering department of the General Electric Company in 1906. In 1911 he went to South America on a special mission for the W. R. Grace Company, and in 1922 to Sao Paulo, Brazil, for the General Electric Company in connection with the electrification of the Paulista Railway Company. He also was engaged in electrification of railroads in South Africa and Russia. He retired in 1932.

JOSEPH S. STOCKDALE, district sales manager, Wood Preserving division, Koppers Company, Pittsburgh, Pa., died suddenly on January 19, at the age of 57. Mr. Stockdale started his business career in the engineering department of the Pittsburgh & Lake Erie Railway, resigning in 1912 to become associated with the sales department of the Pittsburgh Wood Preserving Company, which later was absorbed by the Century Wood Preserving Company, and then The Wood Preserving Corporation, now a division of the Koppers Company. Mr. Stockdale helped in the early development of the wood preserving industry and for many years he was active in the work of the American Wood Preservers' Association.

Personal Mention

General

V. H. JENKINS has been appointed supervisor maintenance of equipment of the Texas & Pacific with headquarters at Dallas, Tex.

FRANK KURZ, assistant fuel engineer of the Southern Pacific at San Francisco, Calif., has been appointed fuel engineer with headquarters at San Francisco.

F. W. BELLINGER, mechanical and electrical superintendent of the Butte, Anaconda & Pacific, has also been appointed general superintendent with headquarters as before at Anaconda, Mont.

MANUEL MANILLASIN has been appointed superintendent of motive power of the Southern Pacific of Mexico, with headquarters at Emplame, Son., succeeding M. L. Verdugo.

W. D. HARTLEY, mechanical superintendent of the Northern district, Western Lines, of the Atchison, Topeka & Santa Fe at La Junta, Colo., has been transferred to the position of mechanical superintendent of the Eastern district, Eastern Lines, with headquarters at Fort Madison, Iowa.

H. C. MCCULLOUGH, master mechanic of the Chicago, Rock Island & Pacific at Silvis, Ill., has been appointed superintendent of motive power of the Second Mechanical district, with headquarters at Kansas City, Mo.

J. E. BROWN, assistant superintendent of motive power of the St. Louis Southwestern, has been appointed superintendent of motive power, with headquarters as before at Pine Bluff, Ark.

C. H. BILTY, mechanical engineer of the Chicago, Milwaukee, St. Paul & Pacific, retired on February 28. Mr. Bilty had been in the service of the Milwaukee for 50 years. For 33 of those years he was mechanical engineer.

J. E. MCQUILLEN, mechanical superintendent of the Gulf, Colorado & Santa Fe at Galveston, Tex., retired on January 30. Mr. McQuillen was born at Rochester, N. Y., on January 25, 1873, and attended the Sacred Heart Academy, Palestine, Tex. He entered railway service in October, 1887, with the International-Great Northern as an enginehouse caller, later serving as a machinist apprentice on the I-G. N. and a machinist, foreman and general foreman in various railroad shops in the United States and Mexico. In September, 1901, he went with the G. C. & S. F. as a machinist at Temple, Tex., later becoming enginehouse gang foreman. In December, 1902, he was promoted to the position of general foreman at Gainesville, Tex., and in November, 1906, to the position of master mechanic at Silsbee, Tex. In August, 1913, Mr. McQuillen was appointed mechanical superintendent at Cleburne, Tex. His headquarters were later transferred to Galveston.

CLARKSON T. HUNT, master mechanic of the Philadelphia division of the Pennsylvania at Harrisburg, Pa., has been appointed superintendent of motive power of the Southwestern division with headquarters at Indianapolis, Ind.

BERT H. SMITH, superintendent of motive power of the Second Mechanical district of the Chicago, Rock Island & Pacific, at Kansas City, Mo., retired on February 1. Mr. Smith entered railroad service on September 1, 1894, as a machinist apprentice in the employ of the Northern Pacific at Brainerd, Minn. In May, 1904, he became enginehouse foreman of the Atchison, Topeka & Santa Fe at Chicago. One year later he was promoted to the position of division foreman, with headquarters at Marceline, Mo., later being transferred to Emporia, Kan. In 1907 he became a representative of a railway supply company, and in October, 1908, was appointed general foreman of the Chicago, Rock Island & Pacific at Caldwell, Kan. From March, 1911, to October, 1914, Mr. Smith was general foreman of the Kansas City, Mexico & Orient (now controlled by the A. T. & S. F.), going to the Rock Island as general foreman at Fairbury, Neb., in 1918. Later he served as master mechanic at various points, including Estherville, Iowa; Horton, Kan.; Little Rock, Ark., and Des Moines and in March, 1940, became superintendent of motive power at Kansas City.

CHARLES F. NEEDHAM, assistant to the vice-president and general manager of the Central region of the Canadian National at Toronto, Ont., has retired from active railway service to accept the position of associate director of National Selective Service (civilian), at Ottawa, Ont. Mr. Needham was born on December 9, 1877, at London, Ont. He entered railroad service in 1898 as an employee in the maintenance of way department of the Grand Trunk (now Canadian National), later serving in the divisional office of the motive-power department for seven years. He was employed in the system motive power department office for 14 years as stenographer, head timekeeper, accountant, chief clerk, and special assistant to the vice-president in charge of the motive-power and car departments, respectively. Subsequently, in 1920, he was appointed assistant to the general superintendent of motive power and car departments, and from January to March, 1923, was acting assistant to the operating manager at Montreal. In the latter year he became assistant to the general manager of the Canadian National at Toronto and in 1934 was appointed assistant to the vice-president and general manager of the Central region.

F. J. HERTER has been appointed mechanical engineer of the Pere Marquette, with headquarters at Grand Rapids, Mich.

WALTER U. APPLETON, vice-president and general manager of the Atlantic region, Canadian National, has been appointed vice-president, with headquarters as before at Moncton, N. B. Mr. Appleton was born on January 29, 1878, at Moncton and entered the service of the Intercolonial as a junior clerk in October, 1890. He served successively until October, 1913, as a machinist apprentice, machinist, chief clerk, assistant to superintendent of motive power, and as general master mechanic for the Intercolonial. When the Intercolonial became a part of the Canadian Government Railways, Mr. Appleton, in February, 1918, was appointed superintendent of motive power, and in December of the same year mechanical superintendent. With the amalgamation of the Canadian Government Railways and the Canadian National System, Mr. Appleton, in September, 1920, was appointed general superintendent of rolling stock, and on March 1, 1923, general superintendent of the Atlantic region. Mr. Appleton became general manager of the Atlantic region on April 15, 1924, and in 1935 also vice-president of that region.

OSCAR G. PIERSON, mechanical superintendent of the Eastern district, Eastern Lines, of the Atchison, Topeka & Santa Fe, with headquarters at Fort Madison, Iowa, has been appointed mechanical superintendent of the Gulf, Colorado & Santa Fe, with headquarters at Galveston, Tex. Mr. Pierson was born at Topeka, Kan., on June 1, 1889, and entered railway service on April 30, 1907, as a machinist apprentice on the Santa Fe at Topeka. On April 1, 1912, he was promoted to the position of foreman of the air-brake room and two years later was transferred to Argentine, Kan., as machinist gang foreman. On February 20, 1916, he became night enginehouse foreman at Arkan-

(*Continued on second left-hand page*)

sas City, Kan., and a year later was transferred to Argentine. Mr. Pierson resigned in December, 1917, to accept work in the Navy Yard at Washington, D. C., and on January 4, 1919, returned to

Oscar G. Pierson

the Santa Fe as a machinist at Argentine. From June 19, 1919, until November 1, 1920, he served successively as machinist gang foreman, air-brake foreman, and enginehouse foreman at Argentine. On the latter date he was appointed general foreman at Arkansas City, and on September 1, 1937, became master mechanic of the Oklahoma and Southern Kansas division. On July 15, 1939, Mr. Pierson was appointed mechanical superintendent with headquarters at Fort Madison.

Master Mechanics and Road Foremen

J. A. DEMPSTER, who has been appointed master mechanic of the Gulf, Mobile & Ohio at Jackson, Tenn., as noted in the

J. A. Dempster

January issue, was born on July 17, 1885, at Whistler, Ala. He attended public school and on June 17, 1900, entered the employ of the Mobile & Ohio (now the Gulf, Mobile & Ohio), as a machinist apprentice. He was an M. & O. machinist from June 17, 1904, until October, 1906, when he became a machinist in the employ of the Missouri Pacific. He returned to the M. & O. as a machinist on December 26, 1906; in February, 1913, became gang foreman; on October 15, 1913, general foreman, and on November 1, 1942, master mechanic.

J. T. GAGHEN has been appointed master mechanic of the Illinois Terminal at Alton, Ill.

P. J. DANNEBERG, master mechanic of the Atchison, Topeka & Santa Fe at Argentine, Kan., has been appointed mechanical superintendent at La Junta, Colo. Mr. Danneberg was born at Argentine, Kan., on October 12, 1894, and entered railroad service in 1909 as a wheel checker in the employ of the Santa Fe at Argentine. He subsequently served as machinist, assistant enginehouse foreman, machinist gang foreman and enginehouse foreman and in 1922 became general locomotive foreman

P. J. Danneberg

at Argentine. In 1937 Mr. Danneberg was appointed master mechanic at Slaton, Tex., being transferred to Clovis, N. M., in 1939, to Winslow, Ariz., later in 1939, and to Argentine in 1941.

FRANK L. HAMM has been appointed assistant road foreman of engines of the Long Island, with headquarters at Morris Park, L. I.

ARTHUR MEEHAN has been appointed road foreman of engines of the Canadian National, with headquarters at Riviere a Pierre, Que.

J. W. MASON, foreman of the erecting shop of the Central of Georgia, at Macon, Ga., has been appointed assistant master mechanic at Macon.

F. N. BURCH, assistant master mechanic of the Macon (Ga.) shops of the Central of Georgia, has been appointed to master mechanic of the Macon shops.

R. E. DETRICK, master mechanic of the Chicago, Rock Island & Pacific at Armourdale, Kan., has been transferred to the position of master mechanic at Silvis, Ill.

C. I. CLUGH, acting chief inspector in the test department at the Altoona, Pa., works of the Pennsylvania, has been appointed master mechanic of the Philadelphia terminal division, with headquarters at Philadelphia, Pa.

C. E. FARLEY, master mechanic of the Chicago, Rock Island & Pacific, at Des Moines, Iowa, has been transferred to the position of master mechanic at Armourdale, Kan.

F. J. SCHLEIHS, master mechanic of the Chicago, Rock Island & Pacific at Dalhart, Tex., has been transferred to the position of master mechanic at Des Moines, Iowa.

C. W. WHISTLER, JR., master mechanic of the Philadelphia terminal division of the Pennsylvania at Philadelphia, Pa., has been transferred to the position of master mechanic of the Philadelphia division, with headquarters at Harrisburg, Pa.

H. J. CROWLEY, road foreman of equipment of the Missouri-Kansas division of the Chicago, Rock Island & Pacific, has been appointed master mechanic at Dalhart, Tex.

H. M. WATERS, an engineer in the employ of the Central of Georgia, has been promoted to the position of road foreman of engines, Macon division, with headquarters at Macon, Ga.

WILLIAM GEORGE GRAY, who has been appointed master mechanic of the Virginian with headquarters at Elmore, W. Va., as announced in the February issue, was born on April 26, 1904, at Lehighton, Pa. He received the degree of B.S. in Industrial Engineering at Pennsylvania State College in 1926 and in September of the same year

W. G. Gray

entered railway service as a special apprentice at the Packerton, Pa., shop of the Lehigh Valley, being transferred in September, 1928, to Sayre, Pa., shop as apprentice instructor. In September, 1929, he was transferred to the office of mechanical engineer, where he worked on various design problems and analyzed road test data both for cars and locomotives. He became car foreman at the Oak Island shop in August, 1930; night foreman in the train yard at Sayre in September, 1931; assistant general foreman, passenger-car shop at Sayre in November, 1931; general supervisor, freight-passenger repairs, in April, 1932, and special engineer in the office of the superintendent of motive power in June, 1937. On January 1, 1939, Mr. Gray left the service of the Lehigh Valley to become engineer freight-car design for the Union Pa-

cific at Omaha, Neb., and on May 1, 1940, was appointed assistant mechanical engineer, Mechanical Division, Association of American Railroads. His service with the Virginian began on October 1, 1941.

S. O. LEWIS has been appointed road foreman of engines of the Baltimore & Ohio, with headquarters at Brunswick, Md.

HARRISON L. PRICE, superintendent of the car shop of the Atchison, Topeka & Santa Fe at Chicago, has been appointed master mechanic with headquarters at Chanute, Kan.

JAMES W. ATKINSON, master mechanic of the Atchison, Topeka & Santa Fe at Fort Madison, Iowa, has been transferred to the position of master mechanic at Argentine, Kan.

G. D. JONES, master mechanic of the Atchison, Topeka & Santa Fe at Chanute, Kan., has been transferred to the position of master mechanic at Fort Madison, Iowa.

Car Department

FRED WIRE, general car foreman of the Atchison, Topeka & Santa Fe at Argentine, Kan., has been appointed superintendent of the car shops at Chicago.

W. G. PALMER has been appointed superintendent of car shop of the Central Region of the Canadian National, with headquarters at London, Ont.

C. F. WEAVER, superintendent of car shop of the Central region of the Canadian National at London, Ont., has been appointed assistant general superintendent of car equipment, with headquarters at Toronto, Ont.

GEORGE E. MCCOY, assistant general superintendent of car equipment, Central region, of the Canadian National at Toronto, Ont., has been appointed assistant chief of car equipment, with headquarters at Montreal, Que. Mr. McCoy was born on January 8, 1886, at Moncton, N. B. He entered railroad service in 1900 as a

George E. McCoy

mechanical draftsman apprentice of the Intercolonial (now Canadian National), serving in that capacity until 1905, when he became draftsman. In 1914, he was promoted to the position of assistant chief draftsman of the Canadian Government Railways (now Canadian National), becoming assistant master car builder in 1916. He was appointed master car builder of the Eastern lines of the Canadian National in 1918; superintendent of car equipment of the Atlantic region in 1923; general superintendent of car equipment of the Atlantic region, with headquarters at Moncton, in 1928, and assistant general superintendent of car equipment of the Central region at Toronto in 1932.

ERIC WYNNE, supervisor of special mechanical work at the Fort Rouge shops of the Canadian National at Winnepeg, Man., has been appointed mechanical inspector, with headquarters at Montreal, Que.

G. C. MAYNARD, air brake inspector of the Canadian National at Toronto, Ont., has been appointed chief inspector of air brakes, with headquarters at Montreal, Que.

Shop and Enginehouse

WALTER R. LANUM, enginehouse and boiler foreman of the Central of Georgia at Macon, Ga., has retired.

HERBERT PARKER, shop draftsman in the employ of the Canadian National at Stratford, Ont., has been appointed supervisor and examiner of apprentices at Stratford.

JULIAN CROSSLEY, wheel shop foreman of the Central of Georgia at Macon, Ga., has been promoted to the position of erecting shop foreman at Macon.

R. G. JEFFERSON, shop foreman of the Central of Georgia, at Savannah, Ga., has been appointed enginehouse and boiler foreman, with headquarters at Macon, Ga.

BENJAMIN F. TYNER, a machinist in the employ of the Central of Georgia at Macon, Ga., has been promoted to the position of wheel shop foreman at Macon.

Purchasing and Stores

W. F. BROWN, chief clerk of the general storekeeper's office of the Wabash, has been appointed acting general storekeeper during the absence of C. L. Wakeman, who has entered military service.

T. F. LYNCH has been appointed general storekeeper of the St. Paul & Sault Ste Marie, with headquarters at Minneapolis, Minn.

E. J. LEONARD, traveling storekeeper of the Chicago & North Western, has been appointed assistant general storekeeper, with headquarters as before in Chicago.

JESSE B. BOYES, purchasing agent and general storekeeper of the Minneapolis, St. Paul & Sault Ste. Marie, the Duluth South Shore & Atlantic, and the Mineral Range, with headquarters at Minneapolis, Minn., retired on January 1.

T. J. RUTH has been appointed acting purchasing agent of the Minneapolis, St. Paul & Sault Ste. Marie, the Duluth, South Shore & Atlantic and the Mineral Range, with headquarters at Minneapolis, Minn.

Obituary

S. TWOGOOD, fuel engineer of the Southern Pacific at San Francisco, Calif., died in the Southern Pacific hospital at San Francisco on January 16.

THOMAS ALEXANDER JOHNSON, master mechanic of the Central of Georgia shops at Macon, Ga., died at a hospital at Macon on January 24, at the age of 56.

WILLIAM J. MILLER, superintendent of motive power of the St. Louis Southwestern, with headquarters at Pine Bluff, Ark., died in that city on January 27. Mr. Miller was born at Philadelphia, Pa., on August 27, 1867. He entered railroad service in 1881 as a machinist apprentice of the Hannibal & St. Joseph (now a part of the Chicago, Burlington & Quincy), and in March, 1886, became a machinist in the employ of the Missouri Pacific. He held similar positions on the Missouri-Kansas-Texas, the Atchison, Topeka & Santa Fe and the Wabash until, in 1897, he was appointed master mechanic of the St. Louis Southwestern at Pine Bluff. In 1914, Mr. Miller was appointed superintendent of motive power.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

"LADY, WILL YOU GIVE A LIFT?"—The Elwell-Parker Electric Company, Cleveland, Ohio. Instruction pamphlet for women operators of power industrial trucks.

◆

CARBIDE GRINDERS. — Hammond Machinery Builders, 1648 Douglas avenue, Kalamazoo, Mich. Bulletin No. 201. Full information on Hammond carbide grinders and their maintenance.

◆

"WELDING AND BRAZING ALCOA ALUMINUM."—Aluminum Company of America, Pittsburgh, Pa. Completely rewritten edition of welding booklet, incorporating the art of brazing. One hundred pages, illustrated, spiral bound. Explains correct use and working of aluminum. Sections on Welding Alcoa Aluminum; Arc Welding; Inspection and Specifications—Gas and Arc Welding; Electric-Resistance Welding; Brazing Alcoa Aluminum.

◆

THREAD-MILLING CUTTERS.—Barber-Colman Company, Rockford, Ill. Sixteen-page bulletin, entitled "Facts About Multiple Thread-Milling Cutters." Clarifies some of the problems connected with ordering, manufacturing and the use of thread-milling cutters under war-time conditions. Shows by pictures and diagrams, with concise descriptive information, how various types of thread-milling cutters are designed, set up, sharpened and used for most satisfactory results.

Travel is Essential in the War Effort

On properly equipped trains, busy men can make use of valuable time *en route.*

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Safety Company car lighting equipment is rugged and reliable. It stands up under all war time demands with minimum maintenance.

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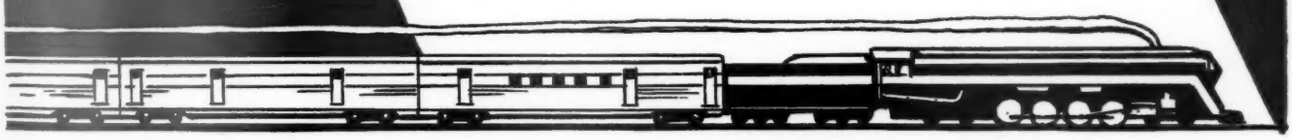
Anderson

PLUGS and RECEPTACLES

TYPE CC RECEPTACLE



Anderson Plugs and Receptacles are designed for the following:

- Air Conditioning
- Battery Charging
- Marker Lights
- Yard Receptacles
- Platform Receptacles
- Portable Tools
- Telephones
- Switchboards
- Welding
- Cable Connectors
- Couplers
- Watertight Plugs and Receptacles
- Turntables

ANDERSON Type CC Passenger Car Receptacle has been a favorite battery charging receptacle these many years, and deservedly so, for no part of equipment has given more consistent economical service. Only the finest materials and design enter into their manufacture coupled with over 40 years experience in battery charging plugs and receptacles.

ANDERSON

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289-305 A Street, Boston, Mass.

NEW YORK CHICAGO PHILADELPHIA LONDON

I'm tellin' you..

No. 7 in a series of tips on "Keeping 'em Turning"
by Jimmy Slevins, over 40 years at LeBlond

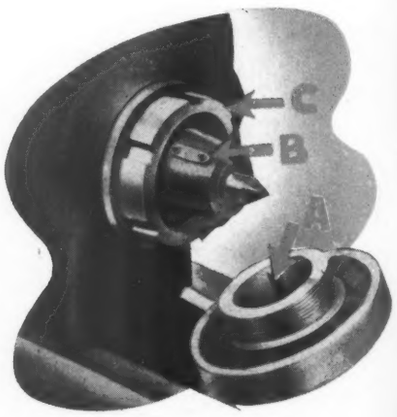
USING A CHUCK

Generally speaking, a chuck is used when the piece to be machined is irregular in shape; large in diameter in proportion to its length; so long as to require its being passed through the spindle; or when it is to be bored or drilled on the lathe axis.

On many lathes more than seven years old, there is a threaded spindle which requires some special handling when you put on or take off a chuck. On today's modern lathe this thread has been replaced with a standard taper spindle nose. Here is the procedure for putting on both types.

TAPER SPINDLE NOSE

Simply place chuck on spindle nose with slot (A) fitted over key (B). This leaves both hands free to start and tighten collar (C). On or off the operation takes 12 to 15 seconds and is practically fool-proof.



OLD TYPE THREADED SPINDLE NOSE

Don't put chuck on with the lathe running. It is dangerous to the operator and bad for the thread.

Hold chuck up to nose and revolve spindle by hand until engaged, then run chuck on by hand. If the chuck is too heavy for steady handling, place on a board across wings of carriage, using the board as a lever to raise chuck in alignment with threaded nose.

Another good practice is to put a large washer made of blotting paper between spindle shoulder and chuck plate. This may seem amateurish, but it helps to compensate for sticking threads which is one of the disadvantages of this old type nose.

THE R. K. LeBLOND MACHINE TOOL CO.

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